CENGAGE

6TH EDITION

Medical Nutrition Therapy

A CASE STUDY APPROACH

Marcia Nahikian Nelms
Kristen Roberts

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Medical Nutrition Therapy

A Case Study Approach

Sixth Edition

Marcia Nahikian Nelms, PhD, RDN, LD, FAND
Kristen Roberts, PhD, RDN, LD, CNSC
Ohio State University

CENGAGE

Australia • Brazil • Canada • Mexico • Singapore • United Kingdom • United States

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

This is an electronic version of the print textbook. Due to electronic rights restrictions, some third party content may be suppressed. Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. The publisher reserves the right to remove content from this title at any time if subsequent rights restrictions require it. For valuable information on pricing, previous editions, changes to current editions, and alternate formats, please visit www.cengage.com/highered to search by ISBN#, author, title, or keyword for materials in your areas of interest.

Important Notice: Media content referenced within the product description or the product text may not be available in the eBook version.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

CENGAGE

Medical Nutrition Therapy: A Case Study Approach, Sixth Edition
Marcia Nahikian Nelms, PhD, RDN, LD, FAND
Kristen Roberts, PhD, RDN, LD, CNSC

Product Team Manager: Maureen McLaughlin

Product Manager: Courtney Heilman

Product Assistant: Hannah Shin

Marketing Manager: Shannon Hawkins

Senior Learning Designer: Paula Dohnal

Senior Content Manager: Kenneth McGrath

Senior Digital Delivery Lead: Dan Swanson

IP Analyst: Ann Hoffman

IP Project Manager: Betsy Hathaway

Composition and Production Service: MPS Limited

Art Director: Lizz Anderson

Cover Designer: Lizz Anderson

Cover Image: JW LTD/Getty Images

© 2022, 2017, 2014 Cengage Learning, Inc.

Unless otherwise noted, all content is © Cengage.

ALL RIGHTS RESERVED. No part of this work covered by the copyright herein may be reproduced or distributed in any form or by any means, except as permitted by U.S. copyright law, without the prior written permission of the copyright owner.

For product information and technology assistance, contact us at Cengage Customer & Sales Support, 1-800-354-9706 or support.cengage.com.

For permission to use material from this text or product, submit all requests online at **www.cengage.com/permissions.**

Library of Congress Control Number: 2020913020

ISBN: 978-0-357-45068-0

Cengage
200 Pier 4 Boulevard
Boston, MA 02210
USA

Cengage is a leading provider of customized learning solutions with employees residing in nearly 40 different countries and sales in more than 125 countries around the world. Find your local representative at **www.cengage.com.**

To learn more about Cengage platforms and services, register or access your online learning solution, or purchase materials for your course, visit **www.cengage.com.**

Printed in the United States of America
Print Number: 01 Print Year: 2021

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

DEDICATION

To my students—past and present—who continue to challenge me, teach me, and guide me as I strive to enhance dietetic education.

Marcia Nahikian-Nelms

To my husband, who never fails to remind me that I can achieve my dreams.

Kristen Roberts

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

CONTENTS

Preface ix

Teaching Strategies xiii

Introducing Case Studies, or Finding Your Way Through a Case Study xv

Acknowledgments xvii

About the Authors xix

Unit One

ENERGY BALANCE AND BODY WEIGHT 1

1 Pediatric Weight Management 3
2 Bariatric Surgery 13
3 Malnutrition Associated with Chronic Disease 27

Unit Two

NUTRITION THERAPY FOR CARDIOVASCULAR DISORDERS 37

4 Hypertension and Cardiovascular Disease 39
5 Myocardial Infarction 51
6 Heart Failure 63

Unit Three

NUTRITION THERAPY FOR UPPER GASTROINTESTINAL DISORDERS 75

7 Gastroesophageal Reflux Disease 77
8 Gastroparesis 89

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Four

NUTRITION THERAPY FOR LOWER GASTROINTESTINAL DISORDERS 99

9 Celiac Disease 101
10 Irritable Bowel Syndrome 109
11 Inflammatory Bowel Disease: Crohn's Disease and Short Bowel Syndrome 119

Unit Five

NUTRITION THERAPY FOR HEPATOBILIARY AND PANCREATIC DISORDERS 131

12 Nonalcoholic Fatty Liver Disease (NAFLD) 133
13 Acute Pancreatitis 143

Unit Six

NUTRITION THERAPY FOR ENDOCRINE DISORDERS 157

14 Pediatric Type 1 Diabetes Mellitus 159
15 Type 2 Diabetes Mellitus: New Adult Diagnosis 173
16 Adult Type 2 Diabetes Mellitus: Transition to Insulin 183

Unit Seven

NUTRITION THERAPY FOR RENAL DISORDERS 195

17 Chronic Kidney Disease Treated with Dialysis 197
18 Chronic Kidney Disease: Peritoneal Dialysis and Renal Transplant 211
19 Acute Kidney Injury 223

Unit Eight

NUTRITION THERAPY FOR NEUROLOGICAL DISORDERS 231

20 Ischemic Stroke 233
21 Progressive Neurological Disease: Alzheimer's Disease 245
22 Young Adult Traumatic Brain Injury 255
23 Pediatric Cerebral Palsy 271

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Nine

NUTRITION THERAPY FOR PULMONARY DISORDERS 279

24 Chronic Obstructive Pulmonary Disease 281

Unit Ten

NUTRITION THERAPY FOR METABOLIC STRESS AND CRITICAL ILLNESS 293

25 Metabolic Stress and Trauma: Gunshot Wound 295

26 Sepsis and Morbid Obesity 307

Unit Eleven

NUTRITION THERAPY FOR NEOPLASTIC DISEASE 319

27 Breast Cancer 321

28 Tongue Cancer Treated with Surgery, Radiation, and Chemotherapy 333

29 Colorectal Cancer 345

Appendices

A Common Medical Abbreviations 355
B Normal Values for Physical Examination 359
C Routine Laboratory Tests with Nutritional Implications 361
D Growth Charts for Case 23 363
E Class Activity: Mini-Cases 365

Index 383

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

PREFACE

In teaching, we seek to promote the fundamental values of humanism, democracy, and the sciences—that is, a curiosity about new ideas and enthusiasm for learning, a tolerance for the unfamiliar, and the ability to critically evaluate new ideas.

We wish to provide the environment that will support students' metacognition. Metacognition is in part the students' awareness of their own learning processes. The use of the case study is an excellent tool to allow the student to process the steps for integration of clinical knowledge and support the ongoing development of their critical thinking skills. Thus, we strive to develop these "laboratories" and "real-world" situations that mimic the professional community to build that bridge to clinical practice.

The idea for this book actually began more than 15 years ago in teaching medical nutrition therapy to dietetic students, and now, as this sixth edition publishes, we strive for these cases to reflect the most recent nutrition therapy practice. Entering the classroom after being a clinician for many years, we want our students to experience nutritional care as realistically as possible. We want the classroom to actually be the bridge between the didactic knowledge and the clinical setting. In fashioning one of the tools used to build that bridge, we rely heavily on our clinical experience and evidence-based practice to develop what we regard as realistic clinical applications. Use of a clinical application or case study is not a new concept; the use of case studies in nutrition, medicine, nursing, and many other allied health fields is commonplace. The case study places the student in a situation that forces integration of knowledge from many sources; it also supports the use of previously learned information, puts the student in a decision-making role, and nurtures critical thinking—thus, metacognition.

What makes this text different, then, from a simple collection of case studies? The pedagogy we have developed over the years with each case takes the student one step closer as he or she moves from the classroom to the real world. The cases represent the most common diagnoses that rely on nutrition therapy as an essential component of the medical care. Therefore, we believe these cases represent the type of patient with which the student will most likely be involved. The concepts presented in these cases can apply to many other medical conditions that may not be presented here. Furthermore, the instructor can choose a variety of questions from each case, even if he or she chooses not to have the student complete the entire case. The cases represent both introductory and advanced-level practice and, therefore, use of this text allows faculty to choose among many cases and questions that fit students' varying skill levels.

The cases cross the life span, allowing the student to see the practice of nutrition therapy during childhood, adolescence, and adulthood through the care of the older adult. We have tried to represent the diversity of individual patients the Registered Dietitian Nutritionist encounters today while placing nutrition therapy and nutrition education within the appropriate cultural context.

The electronic medical record (EMR) provides the structure for each case. The student will seek information to solve the case by using the exact tools he or she will need to use in the clinical setting. As the student moves from the admission or outpatient visit record to the physician's history and physical, to laboratory data, and to documentation of daily care, the student will need to discern the relevant information from the medical record. We have also purposefully integrated interprofessional care throughout as we know team-based care is essential for efficient, optimal care in any health care setting.

Questions for each case are organized using the nutrition care process, beginning with items introducing the pathophysiology and principles of nutrition therapy for the case and then proceeding through each component of the process. Questions prompt the student to identify nutrition problems and then synthesize a PES statement. It will be helpful to begin by orienting the student to the components of a case. We have provided an outline of this introduction below (see "Introducing Case Studies"). Teaching needs to be purposeful. If the faculty member creates an inclusive, supportive environment from which the student can begin to take

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

responsibility for his or her own successful learning, it is much more likely that student autonomy will be the end result.

To be consistent with the philosophy of the text, each case requires that the student seek information from multiple resources to complete the case. Many of the articles and online sites provide essential data regarding diagnosis and treatment within that case. We have found that when students learn how to research the case, their expertise grows exponentially.

The cases lend themselves to be used in multiple teaching situations. They fit easily into a problem-based learning curriculum, and also can be used as a summary for classroom teaching of the pathophysiology and nutrition therapy for each diagnosis. The cases can be integrated into the appropriate rotation for a dietetic internship, medical school, or nursing school curricula. Furthermore, these cases can be successfully used to develop standardized patient and simulation experiences. In this edition we have created a series of mini-cases that provides a focus on one topic of interest within the case. This provides structure for an in-class or small group experience for an in-depth exploration of that topic or for a specific skill development.

Objectives for student learning within each case are built around the nutrition care process and competencies for dietetic education. This edition has also assured that the level of each case is appropriate for the required graduate level as dietetic programs transition to Master's-level training. The use of these cases is also well suited for student distance learning and allows an additional path for nutrition and dietetic faculty to document student performance as part of program assessment.

New to the Sixth Edition

Important factors have prompted the changes to this sixth edition. The template for the cases continues to use the EMR. Though the EMRs used in clinics, physician's offices, and hospitals vary, these cases capture the primary sources of information that the clinician will access to provide a thorough nutrition assessment for her or his patient. The setting for some of the cases has also been changed to reflect outpatient care within the patient-centered medical home.

Furthermore, our reviewers requested that the cases be shortened in length. We have streamlined cases so that questions are more precise. Cases have been changed to better represent the diversity of patients that are seen in the United States and better represent the complexity of comorbidities. Finally, even within a two- to three-year period, medical and nutritional care can change dramatically. These cases reflect the most recent research and evidenced-based literature so that the student moves toward higher levels of practice.

The sixth edition introduces the following major changes and new cases:

Case 2 Bariatric Surgery
Case 3 Malnutrition Associated with Chronic Disease
Case 6 Heart Failure
Case 9 Celiac Disease
Case 11 Inflammatory Bowel Disease: Crohn's Disease and Short Bowel Syndrome
Case 14 Pediatric Type 1 Diabetes Mellitus
Case 15 Type 2 Diabetes Mellitus: New Adult Diagnosis
Case 18 Chronic Kidney Disease: Peritoneal Dialysis and Renal Transplant
Case 21 Progressive Neurological Disease: Alzheimer's Disease
Case 22 Young Adult Traumatic Brain Injury
Case 24 Chronic Obstructive Pulmonary Disease
Case 25 Metabolic Stress and Trauma: Gunshot Wound
Case 29 Colorectal Cancer

For the additional cases you will find in this edition—although the diagnosis may have been included in previous editions—the cases have been significantly changed to reflect current medical care with appropriate changes in drugs, procedures, and nutrition interventions. Many cases reflect micronutrient deficiencies, which are often neglected in current clinical practice. Multiple cases provide data for a nutrition-focused physical examination, allowing for the malnutrition diagnostic criteria to be applied. Incorporation of evidence-based guidelines is encouraged throughout each of the cases, and the questions are designed to not only follow the nutrition care process but also require the student to evaluate and apply the most current literature.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Student and Instructor Resources

MindTap: A new approach to highly personalized online learning. Beyond an eBook, homework solution, digital supplement, or premium website, MindTap is a digital learning platform that works alongside your campus LMS to deliver course curriculum across the range of electronic devices in your life. MindTap is built on an "app" model allowing enhanced digital collaboration and delivery of engaging content across a spectrum of Cengage and non-Cengage resources.

Instructor Companion Site: Everything you need for your course in once place! This collection of Answer Guide, Case Questions in Word format, and Nutrition Diagnoses for each case is available online via www.cengage.com/login.

Diet & Wellness Plus: Diet & Wellness Plus helps you understand how nutrition relates to your personal health goals. Track your diet and activity, generate reports, and analyze the nutritional value of the food you eat. Diet & Wellness Plus includes over 75,000 foods as well as custom food and recipe features. The Behavior Change Planner helps you identify risks in your life and guides you through the key steps to make positive changes. Diet & Wellness Plus is also available as an app that can be accessed from the app dock in MindTap.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

TEACHING STRATEGIES

You can find cases to emphasize specific topics that are part of the curriculum for pathophysiology and medical nutrition therapy (a list of cases by topic is provided below). Every case has data for a nutrition assessment and can be incorporated within multiple courses for repeated exposure for development of these foundational skills. We have found that when specific questions are selected for each case, they can assist in the pedagogy for other classes as well.

Surgical Cases: Case 2 Bariatric Surgery; Case 11 Inflammatory Bowel Disease: Crohn's Disease and Short Bowel Syndrome; Case 25 Metabolic Stress and Trauma: Gunshot Wound; Case 26 Sepsis and Morbid Obesity; Case 28 Tongue Cancer Treated with Surgery, Radiation, and Chemotherapy; Case 29 Colorectal Cancer

Micronutrient Assessment/Nutritional Supplementation: Case 2 Bariatric Surgery; Case 3 Malnutrition Associated with Chronic Disease; Case 5 Myocardial Infarction; Case 6 Heart Failure; Case 9 Celiac Disease; Case 10 Irritable Bowel Syndrome; Case 11 Inflammatory Bowel Disease: Crohn's Disease and Short Bowel Syndrome; Case 18 Chronic Kidney Disease: Peritoneal Dialysis and Renal Transplant; Case 19 Acute Kidney Injury; Case 21 Progressive Neurological Disease: Alzheimer's Disease; Case 23 Pediatric Cerebral Palsy; Case 26 Sepsis and Morbid Obesity; Case 27 Breast Cancer; Case 28 Tongue Cancer Treated with Surgery, Radiation, and Chemotherapy

NFPE/Malnutrition Documentation: Case 3 Malnutrition Associated with Chronic Disease; Case 6 Heart Failure; Case 9 Celiac Disease; Case 19 Acute Kidney Injury; Case 21 Progressive Neurological Disease: Alzheimer's Disease; Case 23 Pediatric Cerebral Palsy; Case 26 Sepsis and Morbid Obesity; Case 28 Tongue Cancer Treated with Surgery, Radiation, and Chemotherapy; Case 29 Colorectal Cancer

Oral Supplementation: Case 3 Malnutrition Associated with Chronic Disease; Case 21 Progressive Neurological Disease: Alzheimer's Disease; Case 28 Tongue Cancer Treated with Surgery, Radiation, and Chemotherapy

Dysphagia: Case 3 Malnutrition Associated with Chronic Disease; Case 20 Ischemic Stroke; Case 21 Progressive Neurological Disease: Alzheimer's Disease; Case 23 Pediatric Cerebral Palsy

Fluid and Electrolyte Balance: Case 3 Malnutrition Associated with Chronic Disease; Case 11 Inflammatory Bowel Disease: Crohn's Disease and Short Bowel Syndrome; Case 16 Adult Type 2 Diabetes Mellitus: Transition to Insulin; Case 17 Chronic Kidney Disease Treated with Dialysis; Case 18 Chronic Kidney Disease: Peritoneal Dialysis and Renal Transplant; Case 19 Acute Kidney Injury; Case 21 Progressive Neurological Disease: Alzheimer's Disease; Case 22 Young Adult Traumatic Brain Injury; Case 24 Chronic Obstructive Pulmonary Disease; Case 26 Sepsis and Morbid Obesity; Case 29 Colorectal Cancer

Acid-Base Balance: Case 6 Heart Failure; Case 13 Acute Pancreatitis; Case 19 Acute Kidney Injury; Case 24 Chronic Obstructive Pulmonary Disease; Case 25 Metabolic Stress and Trauma: Gunshot Wound; Case 26 Sepsis and Morbid Obesity

Genetics/Immunology/Infectious Process: Case 9 Celiac Disease; Case 11 Inflammatory Bowel Disease: Crohn's Disease and Short Bowel Syndrome; Case 14 Pediatric Type 1 Diabetes Mellitus; Case 17 Chronic Kidney Disease Treated with Dialysis; Case 24 Chronic Obstructive Pulmonary Disease; Case 26 Sepsis and Morbid Obesity; Case 27 Breast Cancer; Case 28 Tongue Cancer Treated with Surgery, Radiation, and Chemotherapy; Case 29 Colorectal Cancer

Hypermetabolism/Metabolic Stress: Case 13 Acute Pancreatitis; Case 19 Acute Kidney Injury; Case 22 Young Adult Traumatic Brain Injury; Case 24 Chronic Obstructive Pulmonary Disease; Case 25 Metabolic Stress and Trauma: Gunshot Wound; Case 26 Sepsis and Morbid Obesity

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Nutritional Needs of the Elderly: Case 3 Malnutrition Associated with Chronic Disease; Case 19 Acute Kidney Injury; Case 21 Progressive Neurological Disease: Alzheimer's Disease; Case 24 Chronic Obstructive Pulmonary Disease

Pediatrics: Case 1 Pediatric Weight Management; Case 9 Celiac Disease; Case 14 Pediatric Type 1 Diabetes Mellitus; Case 23 Pediatric Cerebral Palsy

Nutrition Support: Case 6 Heart Failure; Case 8 Gastroparesis; Case 11 Inflammatory Bowel Disease: Crohn's Disease and Short Bowel Syndrome; Case 13 Acute Pancreatitis; Case 19 Acute Kidney Injury; Case 22 Young Adult Traumatic Brain Injury; Case 24 Chronic Obstructive Pulmonary Disease; Case 25 Metabolic Stress and Trauma: Gunshot Wound; Case 26 Sepsis and Morbid Obesity; Case 28 Tongue Cancer Treated with Surgery, Radiation, and Chemotherapy; Case 29 Colorectal Cancer

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

INTRODUCING CASE STUDIES, OR FINDING YOUR WAY THROUGH A CASE STUDY

Have you ever put together a jigsaw puzzle or taught a young child how to complete a puzzle?

Almost everyone has at one time or another. Recall the steps that are necessary to build a puzzle. You gather together the straight edges, identify the corner pieces, and match the like colors. There is a method and a procedure to follow that, when used persistently, leads to the completion of the puzzle.

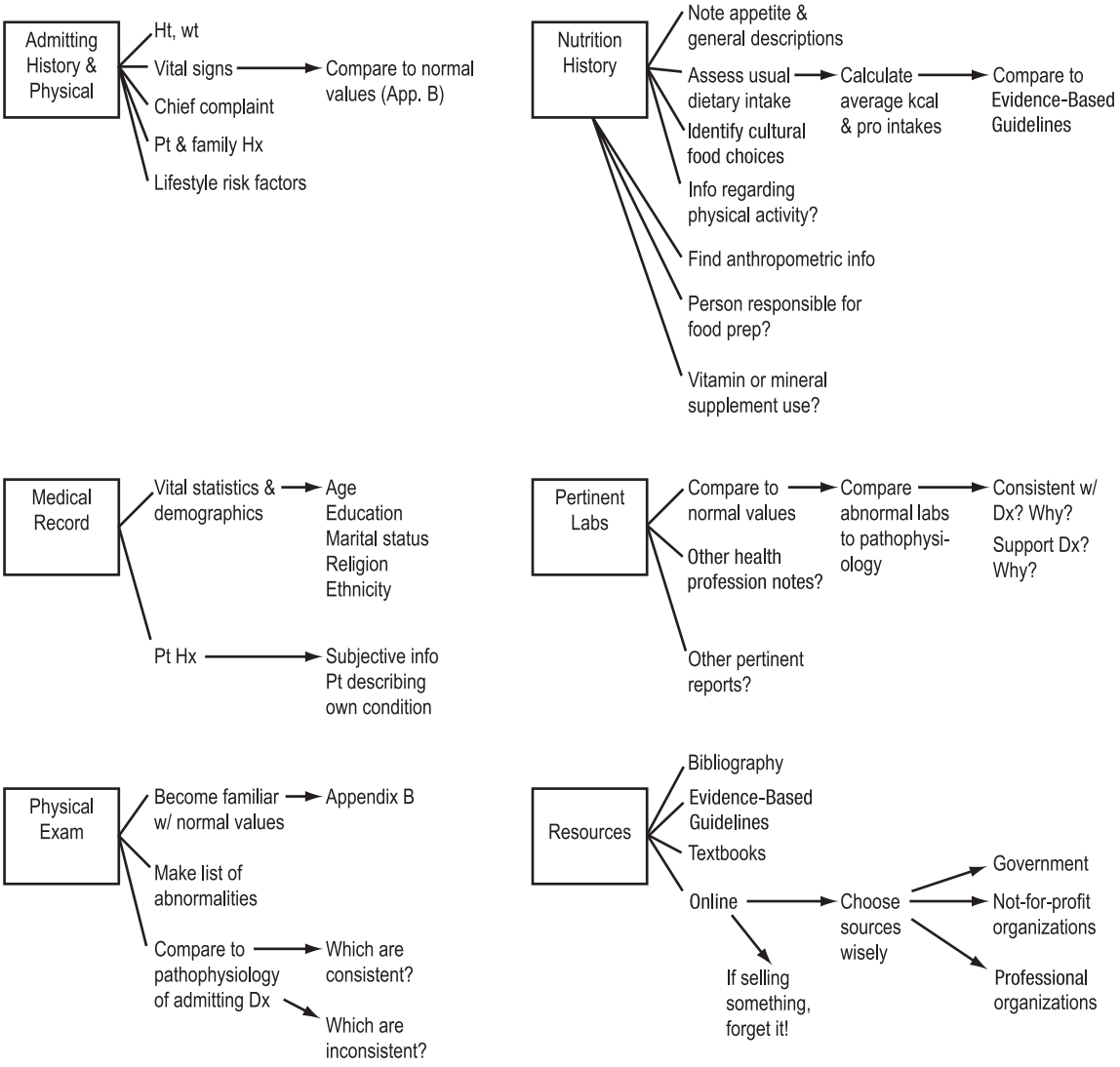
Finding your way through a case study is much like assembling a jigsaw puzzle. Each piece of the case study tells a portion of the story. As a student, your job is to put together the pieces of the puzzle to learn about a particular diagnosis, its pathophysiology, and the subsequent medical and nutritional treatment. Although each case in the text is different, the approach to working with the cases remains the same, and with practice, each case study and each medical record becomes easier to manage. The following steps provide guidance for working with each case study.

1. Identify the major parts of the case study.
   - Admitting history and physical
   - Documentation of MD orders, nursing assessment, and results from other care providers
   - Laboratory data
   - Bibliography
2. Read the case carefully.
   - Get a general sense of why the person has been admitted to the hospital.
   - Use a medical dictionary to become acquainted with unfamiliar terms.
   - Use the list of medical abbreviations provided in Appendix A to define any that are unfamiliar to you.
3. Examine the admitting history and physical for clues.
   - Height, Weight
   - Vital signs (compare to normal values for physical examination in Appendix B)
   - Chief complaint
   - Patient and family history
   - Lifestyle risk factors
4. Review the medical record.
   - Examine the patient's vital statistics and demographic information (e.g., age, education, marital status, religion, ethnicity).
   - Read the patient history (remember, this is the patient's subjective information).
5. Use the information provided in the physical examination.
   - Familiarize yourself with the normal values found in Appendix B.
   - Make a list of those things that are abnormal.
   - Now compare abnormal values to the pathophysiology of the admitting diagnosis. Which are consistent? Which are inconsistent?
6. Evaluate the nutrition history.
   - Note appetite and general descriptions.
   - Evaluate the patient's dietary history: calculate average kcal and protein intakes and compare to population standards and recommendations such as the USDA Food Patterns.
   - Is there any information regarding physical activity?
   - Find anthropometric information.
   - Is the patient responsible for food preparation?
   - Is the patient taking a vitamin or mineral supplement?
7. Review the laboratory values.
   - Hematology
   - Chemistry
   - What other reports are present?
   - Compare the values to the normal values listed. Which are abnormal? Highlight those and then compare to the pathophysiology. Are they consistent with the diagnosis? Do they support the diagnosis? Why?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

8. Use your resources.
- Use the bibliography provided for each case.
- Review your nutrition textbooks.
- Access online resources but choose your sources wisely: stick to government, not-for-profit organizations, and other legitimate sites. A list of reliable online evidence-based resources is provided for each case.



Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

ACKNOWLEDGMENTS

We would like to thank the following Ohio State University graduate student in medical dietetics who provided input to the cases and the answer guide: Hannah Huffman, MS, RDN, LD. We also have several contributors to new cases, and we are fortunate to benefit from the expertise of these outstanding clinicians: Holly Estes Doetsch, MS, RDN, LD, CNSC; and Emily Hill, MS, RDN, LD. We have continued to build upon cases from our previous contributors to this text: Georgiana Sergakis, PhD, RRT, RCP; Dawn Scheiderer, RDN, LD; Dena Champion, MS, RD, CSO; and Colleen Spees, PhD, RDN, LD, FAND.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

ABOUT THE AUTHORS

Marcia Nahikian-Nelms, PhD, RDN, LD, FAND

Dr. Marcia Nahikian-Nelms is currently a professor of clinical health and rehabilitation sciences and the Director of Academic Affairs in the School of Health and Rehabilitation Sciences and the Director of Education for Faculty Advancement, Mentoring and Engagement—College of Medicine at The Ohio State University. She has practiced as a dietitian and public health nutritionist for over 35 years. She is the lead author for several textbooks and the author of peer-reviewed journal articles and chapters for other texts.

Her clinical expertise focuses on development and practice of evidence-based nutrition therapy for both pediatric and adult populations as well as the development of alternative teaching environments for students within their clinical training.

Dr. Nahikian-Nelms serves as one of the faculty leads for Interprofessional Education (IPE) and has contributed to the design of multiple simulations and IPE experiences within the seven health science colleges at The Ohio State University. She has received the Ohio State University Alumni Award for Distinguished Teaching, the Governor's Award for Outstanding Teaching for the State of Missouri, Outstanding Dietetic Educator in Missouri and Ohio, Outstanding Teacher in Health and Rehabilitation Sciences, and received the PRIDE award from Southeast Missouri State University in recognition of her teaching.

Kristen Roberts, PhD, RDN, LD, CNSC

Dr. Kristen Roberts is currently an assistant professor of clinical health and rehabilitation sciences and lead for medical nutrition therapy and clinical nutrition content for the Future Education Model Program. She serves as nutrition faculty in the Division of Gastroenterology, Hepatology, and Nutrition in the College of Medicine at The Ohio State University. She has practiced as an RDN for over 15 years and has contributed several peer-reviewed journal articles and chapters for other texts focused on gastrointestinal nutrition, critical care, and specialized nutrition support. She is the co-editor for the text *Short Bowel Syndrome: Nutritional, Surgical and Medical Management.* Additionally, she has contributed to the Academy of Nutrition and Dietetics *Evidence Analysis Library* sections on celiac disease, and has served on various committees within the American Society for Parenteral and Enteral Nutrition. Dr. Roberts has received the Dietitians in Nutrition Support Distinguished Practice Award through the Academy of Nutrition and Dietetics.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit One

ENERGY BALANCE AND BODY WEIGHT

Case 1 introduces nutrition therapy for treatment of disorders of weight balance and draws our attention to these major public health concerns in the United States. The first case addresses pediatric obesity and can be used as a springboard for a discussion of the implications of the rapidly rising rate of childhood obesity. The incidence of childhood obesity has more than tripled over the past three decades with an estimated 13.7 million children and adolescents in the United States meeting the criteria for overweight and obesity. The child featured in Case 1 is representative of children ages 6–11. The obesity rate for children and adolescents aged 2–19 years is approximately 18.5%. Pediatric obesity treatment requires complex interventions to address family, environmental, and economic concerns. This case allows the student to explore the current research and the use of evidence-based guidelines to determine appropriate medical nutrition therapy.

Case 2 uses the record of a bariatric surgery patient as an opportunity to learn about morbid obesity and the potential nutritional complications of bariatric surgery. Approximately 7.7% of the U.S. population are considered to be morbidly obese, also referred to as Class III obesity or a body mass index (BMI) ≥40.0. Health consequences of untreated morbid obesity include type 2 diabetes mellitus, coronary heart disease and hypertension, cancer, sleep apnea, and premature death. According to the 2013 American Society for Metabolic & Bariatric Surgery, American Association of Clinical Endocrinologists, and The Obesity Society consensus guidelines, those individuals with a BMI ≥40.0 or ≥35.0 and who meet the medical criteria may consider bariatric surgery as a treatment method for weight control. This case directs the student to research the surgical options used for bariatric surgery in order to begin to understand the progression of nutrition therapy used and identify potential nutritional complications that may occur post-operatively.

Case 3 explores the diagnosis of malnutrition. As early as 1979, Charles Butterworth attempted to raise awareness of the increasing incidence of malnutrition in the U.S. health care system with his classic article, "The Skeleton in the Hospital Closet." Unfortunately, the rate of malnutrition is still considered to be significant today—and is associated with increased hospital costs, increased morbidity and mortality, and decreased quality of life for these individuals. Definitions of malnutrition have been proposed by the Academy of Nutrition and Dietetics (AND) and the American Society for Parenteral and Enteral Nutrition (ASPEN) in an effort to consistently identify those individuals who are at risk for malnutrition and who are malnourished, so that expedient interventions may occur. This case uses the most recent literature to provide the opportunity to assess, diagnose, and develop a treatment plan for malnutrition in an older adult. Inclusion of the nutrition-focused physical exam (NFPE) and a description of usual intake will allow the student to recognize and apply the diagnostic criteria practice of malnutrition using ASPEN/AND guidelines. The minicase found in Appendix E emphasizes the use of the NFPE while allowing the instructor to create a quick, hands-on experience in the classroom. Cranial nerve assessment adds a new aspect to the NFPE to foster discussion and enhance RDN assessment skills.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 1

Pediatric Weight Management

Jamey Whitmer is taken to see her pediatrician by her parents, who have noticed she appears to stop breathing while sleeping. She is diagnosed with sleep apnea related to her weight and referred to the registered dietitian nutritionist (RDN) for nutrition counseling.

Objectives

After completing this case, the student will be able to:

1. Describe the physiological effects of overweight/obesity in the pediatric population.
2. Interpret laboratory parameters for nutritional implications and significance.
3. Analyze nutrition assessment data to evaluate nutritional status and identify specific nutrition problems.
4. Determine nutrition diagnoses and write appropriate PES statements.
5. Prescribe appropriate medical nutrition therapy.
6. Develop a nutrition care plan with appropriate measurable goals, interventions, and strategies for monitoring and evaluation consistent with the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Whitmer, Jamey, *Female, 10 y.o.*
Allergies: *No known allergies* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *University Clinic* **Physician:** *Lambert, S. David* **Appointment Date:** *9/22*

iStock.com/IPGGutenbergUKLtd

Patient Summary: 10-year-old female is here with parents, who describe concerns that their daughter appears to stop breathing while she is sleeping.

History:

Onset of disease: Parents describe sleep disturbance in their daughter for the past several years, including: sleeping with her mouth open, cessation of breathing for at least 10 seconds (per episode), snoring, restlessness during sleep, enuresis, and morning headaches. They also mention that Jamey's teacher reports difficulty concentrating in school and a change in her classroom performance. She is the second child born to these parents—full-term infant with birthweight of 10 lbs 5 oz; 23" length. Actual date of onset for current medical problems is unclear, but parents first noticed onset of the above-mentioned symptoms about one year ago.
Medical history: None
Surgical history: None
Family history: What? Possible gestational diabetes; type 2 DM; Who? Mother and grandmother

Demographics:

Years education: Third grade
Language: English only
Occupation: Student
Household members: Father age 36, mother age 35, sister age 5
Ethnicity: Caucasian
Religious affiliation: Presbyterian

MD Progress Note:

General/Constitutional: Well-developed, well-nourished, somewhat tired and irritable.
HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: oral mucosa pink, dentition in good repair
Throat: pharynx pink without exudates. Tonsillar hypertrophy.
Neck: soft, supple, no palpable masses. No lymphadenopathy.
Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants. No masses, no organomegaly. No guarding, rebound, or CVA tenderness.
Extremities: Normal range of motion in all four extremities. No cyanosis or clubbing or peripheral edema. Occasional c/o of nonspecific knee pain.
Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Whitmer, Jamey, *Female, 10 y.o.*
Allergies: *No known allergies* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *University Clinic* **Physician:** *Lambert, S. David* **Appointment Date:** *9/22*

Skin: Skin is warm and dry. Patient is not diaphoretic. Rash in skinfolds. No noted ulcerations.

Vital Signs: Temp: 98.5°F Pulse: 85 Resp rate: 27
BP: 123/80 Height: 57" Weight: 115 lbs BMI: 24.9

Assessment and Plan:
10-y.o. female here with parents c/o of breathing difficulty at night. Child has steadily gained weight over previous several years: >10 lbs per year.

Dx: R/O obstructive sleep apnea (OSA) secondary to obesity and physical inactivity.

Medical Tx plan: Polysomnography to diagnose OSA, FBG, HbA_{1C}, lipid panel (total cholesterol, HDL-C, LDL-C, triglycerides), psychological evaluation, and nutrition assessment.

..... SD Lambert, MD

Nutrition:
General: Very good appetite with consumption of a wide variety of foods. Jamey's physical activity level appears to be minimal. Her elementary school discontinued physical education, art, and music classes due to budget cuts five years ago. She likes playing video games and reading. Mother is 5'2" and weighs 225 lbs. Father is 5'10" and weighs 185 lbs. Sister has a weight/height at 85%tile with BMI at 75%tile.

24-hour recall:

AM:	2 breakfast burritos, 8 oz whole milk, 4 oz apple juice, 6 oz coffee with ¼ c cream and 2 tsp sugar
Lunch:	2 ham and cheese sandwiches with 1 tbsp mayonnaise each, 1-oz pkg Fritos corn chips, 5–6 Oreos, 8 oz whole milk
After-school snack:	Peanut butter and jelly sandwich (2 slices enriched bread with 2 T. crunchy peanut butter and 2 tbsp grape jelly), 12 oz whole milk
Dinner:	Fried chicken (2 legs and 1 thigh), 1 c mashed potatoes (made with whole milk and butter), 1 c fried okra, 20 oz sweet tea
Snack:	3 c microwave popcorn, 12 oz Coca-Cola

Food allergies/intolerances/aversions: NKA
Previous nutrition therapy? No
Food purchase/preparation: Parent(s)
Vitamin intake: Flintstones vitamin daily

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Whitmer, Jamey, *Female, 10 y.o.*
Allergies: *No known allergies* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *University Clinic* **Physician:** *Lambert, S. David* **Appointment Date:** *9/22*

Laboratory Results (Pediatric)

	Ref. Range	9/22
Chemistry		
Sodium, 10–14 yo (mEq/L)	136–145	142
Potassium, 10–14 yo (mEq/L)	3.5–5.0	4.3
Chloride, 10–14 yo (mEq/L)	98–108	101
Carbon dioxide, 10–14 yo (mEq/L)	22–30	25
BUN, 10–14 yo (mg/dL)	5–18	8
Creatinine serum, 10–14 yo (mg/dL)	≤1.2	0.6
Uric acid, 10–14 yo (mg/dL)	2.5–5.5	3.1
Glucose, 10–14 yo (mg/dL)	70–99	112 !↑
Phosphate, inorganic, 10–14 yo (mg/dL)	2.2–4.6	3.1
Magnesium, 10–14 yo (mg/dL)	1.6–2.6	1.7
Calcium, 10–14 yo (mg/dL)	8.6–10.5	9.1
Osmolality, 10–14 yo (mmol/kg/H_2O)	275–295	302 !↑
Bilirubin total, 10–14 yo (mg/dL)	≤1.2	0.9
Bilirubin, direct, 10–14 yo (mg/dL)	<0.3	0.2
Protein, total, 10–14 yo (g/dL)	6–7.8	6.5
Albumin, 10–14 yo (g/dL)	3.5–5	4.8
Prealbumin, 10–14 yo (mg/dL)	17–39	33
Cholesterol, 10–14 yo (mg/dL)	<170	165
HDL-C, 10–14 yo (mg/dL)	>45	34 !↓
VLDL, 10–14 yo (mg/dL)	calculated	13
LDL, 10–14 yo (mg/dL)	<110	118 !↑
LDL/HDL ratio, 10–14 yo	<3	9.07
Triglycerides, 10–14 yo (mg/dL)	<90	65
T_4, 10–14 yo (μg/dL)	5.6–11.7	6.1
T_3, 10–14 yo (μg/dL)	83–213	79 !↓
HbA_{1C}, 10–14 yo (%)	3.9–5.2	4.5
Hematology		
WBC, 10–14 yo ($\times 10^3/mm^3$)	4.0–13.5	4.1
Hemoglobin, 10–14 yo (Hgb, g/dL)	11–16	13.1
Hematocrit, 10–14 yo (Hct, %)	31–43	38

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. Current research indicates that the cause of childhood obesity is multifactorial. Briefly outline how genetics, environment, and nutritional intake might contribute to the development of obesity in children. Include at least three specific factors in each of the previously mentioned categories.

2. Describe one health consequence for obese children affecting each of the following physiological systems: cardiovascular, orthopedic, pulmonary, gastrointestinal, and endocrine.

3. How does Jamey's current weight status affect her risk of developing adulthood obesity?

4. Jamey has been diagnosed with obstructive sleep apnea. What is *obstructive sleep apnea*? Explain the relationship between sleep apnea and obesity.

II. Understanding the Nutrition Therapy

5. In general, what are the goals for weight loss in the pediatric population? Are there concerns to consider when developing recommendations for an overweight child who is still growing?

6. List four recommendations that might serve as goals for the nutritional treatment of Jamey's obesity.

III. Nutrition Assessment

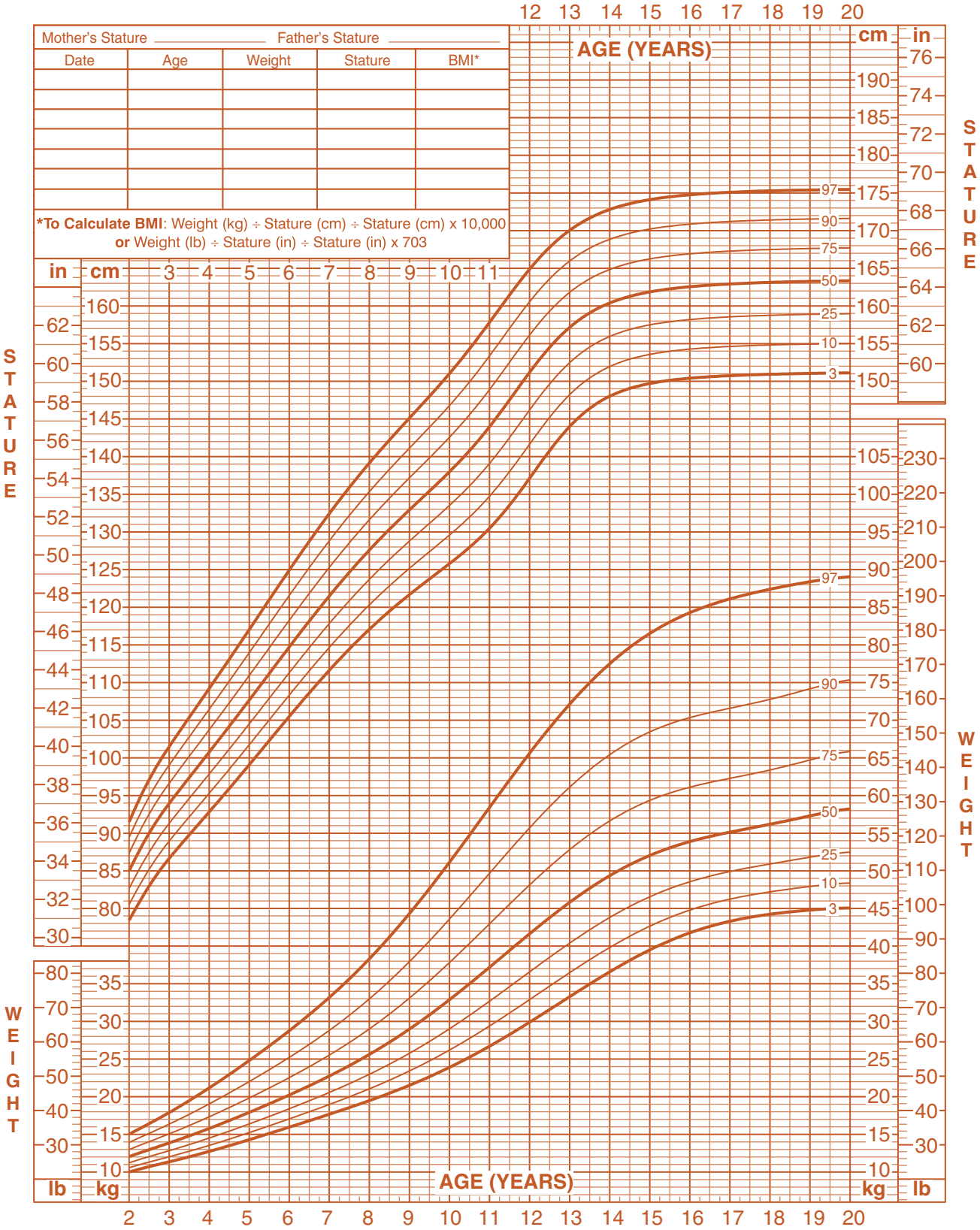
7. Assess Jamey's weight using the CDC growth charts provided (p. 8): What is Jamey's BMI percentile? How is her weight status classified? Use the growth chart to determine Jamey's optimal weight for her height and age.

8. Identify two methods for determining Jamey's energy requirements other than indirect calorimetry, and then use them to calculate Jamey's energy requirements. What calorie goal would you use to facilitate weight loss?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Stature-for-Age and Weight-for-Age Percentiles: Girls, 2 to 20 Years



Source: Centers for Disease Control and Prevention

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

9. Dietary factors associated with increased risk of overweight include increased dietary fat intake and increased calorie-dense beverages. Identify foods from Jamey's 24-hour recall that fit these criteria.

10. Calculate the percent of kcal from each macronutrient and the percent of kcal provided by fluids for Jamey's diet recall.

11. Increased fruit and vegetable intake is associated with decreased risk of overweight. What foods in Jamey's diet fall into these categories?

12. Use the U.S. Dietary Guidelines to generate a customized daily food plan to plan a 1-day menu for Jamey.

13. Why did Dr. Lambert order a lipid profile and blood glucose tests? What lipid and glucose levels are considered altered (i.e., outside of normal limits) for the pediatric population? Evaluate Jamey's lab results.

IV. Nutrition Diagnosis

14. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

15. Which behaviors associated with increased risk of overweight would you look for when assessing Jamey and her family's diets? What aspects of Jamey's lifestyle place her at increased risk for overweight?

16. You talk with Jamey and her parents, who are friendly and cooperative. Jamey's mother asks if it would help for them to not let Jamey snack between meals and to reward her with dessert when she exercises. What would you tell the family regarding snacks between meals and rewards with dessert after exercise?

17. Identify one specific physical activity recommendation for Jamey.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

18. For each PES statement written, establish an ideal goal (based on signs and symptoms) and an appropriate intervention (based on etiology).

19. Mr. and Mrs. Whitmer ask about gastric bypass surgery for Jamey. Based on the Endocrine Society Practice Guideline, what are the recommendations regarding gastric bypass surgery for the pediatric population?

VI. Nutrition Monitoring and Evaluation

20. What is the optimal length of weight management therapy for Jamey?

21. Should her parents be included? Why or why not?

22. What would you assess during a follow-up counseling session? When should this occur?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

2018 National Survey of Children's Health: Data Users Frequently Asked Questions (FAQs). census.gov. https://www2.census.gov/programs-surveys/nsch/technical-documentation/methodology/2018-NSCH-FAQs.pdf. Published October 7, 2019. Accessed June 17, 2020.

Balanced Macronutrient Diet and Treating Childhood Obesity in Children Ages 6–12 (2006). Academy of Nutrition and Dietetics Evidence Analysis Library. https://www.andeal.org/topic.cfm?cat=2914&conclusion_statement_id=250444. Published 2006. Accessed January 13, 2020.

CDC Growth Charts: United States. cdc.gov. http://www.cdc.gov/growthcharts/. Updated September 9, 2010. Accessed January 13, 2020.

Childhood Obesity Facts. cdc.gov. https://www.cdc.gov/obesity/data/childhood.html. Updated June 24, 2019. Accessed January 27, 2020.

Dietary Reference Intakes for Energy, *Carbohydrate, Fiber, Fat, Fatty Acids*, *Cholesterol, Protein, and Amino Acids*. Washington, DC: National Academy of Sciences Food and Nutrition Board, The National Academies Press; 2005.

Marcus C, Brooks L, Draper K, et al. Diagnosis and management of childhood obstructive sleep apnea syndrome. *Pediatrics.* 2012;130,576–584. https://pediatrics.aappublications.org/content/130/3/576. Published September 2012. Accessed June 18, 2020.

Nahikian-Nelms ML. Diseases and disorders of energy imbalance. In Nelms M, Roth SL, Sucher KP. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Wadsworth, Cengage Learning; 2019:254–295.

Noqueira I, Hrovat K. Adolescent bariatric surgery: Review on nutrition considerations. *Nutr Clin Pract*. 2014;29:740–746.

Nutrition Communicators Network. United States Department of Agriculture: ChooseMyPlate. https://www.choosemyplate.gov/browse-by-audience/view-all-audiences/professionals. Accessed January 13, 2020.

Pan L, Blanck HM, Park S, et al. State-specific prevalence of obesity among children aged 2–4 years enrolled in the special supplemental nutrition program for women, infants, and children—United States, 2010–2016. *Morb Mortal Wkly Rep.* 2019;68(46):1057–1061. doi: http://dx.doi.org/10.15585/mmwr.mm6846a3.

Pediatric Weight Management (PWM): Major Recommendations (2015). Academy of Nutrition and Dietetics Evidence Analysis Library. http://www.andeal.org/topic.cfm?menu=5296&cat=2724. Published 2015. Accessed January 13, 2020.

PMW: Physical Activity in the Treatment of Childhood and Adolescent Obesity (2007). Academy of Nutrition and Dietetics Evidence Analysis Library. http://www.andeal.org/template.cfm?template=guide_summary&key=1224. Published 2007. Accessed January 13, 2020.

PWM: Balanced Macronutrient: Children Ages 6–12 (2006). Academy of Nutrition and Dietetics Evidence Analysis Library. http://www.andeal.org/topic.cfm?cat=2914&conclusion_statement_id=250444. Published 2006. Accessed January 13, 2020.

PWM: Major Recommendations (2007). Academy of Nutrition and Dietetics Evidence Analysis Library. http://www.andeal.org/topic.cfm?menu=5296&cat=2724. Published 2007. Accessed January 13, 2020.

PWM: Physical Activity and Inactivity (2006). Academy of Nutrition and Dietetics Evidence Analysis Library. http://www.andeal.org/topic.cfm?cat=2940&conclusion_statement_id=105. Published 2006. Accessed January 13, 2020.

Qiao Y, Ma J, Wang Y, et al. Birth weight and childhood obesity: A 12-country study. *Int J Obes Suppl.* 2015;5(Suppl 2):S74–S79.

Recommendation Summary: Pediatric Weight Management (PWM): Physical Activity in the Treatment of Childhood and Adolescent Obesity. Academy of Nutrition and Dietetics Evidence Analysis Library. http://www.andeal.org/template.cfm?template=guide_summary&key=1224. Published 2005–2006. Accessed January 13, 2020.

Skinner AC, Ravanbakht SN, Skelton JA, Perrin EM, Armstrong SC. Prevalence of obesity and severe obesity in US children, 1999–2016. *Pediatrics.* 2018;141(3):e20173459. doi:10.1542/peds.2017–3459.

Styne DM, Arsinian SA, Connor EL, et al. Pediatric obesity-assessment, treatment and prevention: An Endocrine Society clinical practice guideline. *J Clinic Endocrinol Metab*. 2017;102:709–757.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Internet Resources

American Academy of Pediatrics—Institute for Healthy Childhood Weight: https://ihcw.aap.org/Pages/default.aspx

American Sleep Apnea Association: http://www.sleepapnea.org/

Baylor College of Medicine Children's Nutrition Research Center: https://www.bcm.edu/departments/pediatrics/sections-divisions-centers/childrens-nutrition-research-center/

Baylor College of Medicine Children's Nutrition Research Center. Interactive Calculators: https://www.bcm.edu/departments/pediatrics/sections-divisions-centers/childrens-nutrition-research-center/nutrition-resources/interactive-calculators

Centers for Disease Control and Prevention. "Basics about Childhood Obesity": https://www.cdc.gov/obesity/childhood/index.html

Peditools: https://peditools.org/

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 2

Bariatric Surgery

Mrs. Turner is admitted for a Roux-en-Y gastric bypass surgery. She has co-morbidities of T2DM, hyperlipidemia, hypertension, and osteoarthritis. Mrs. Turner has weighed over 250 lbs since age 15, with steady weight gain since that time. She has attempted to lose weight numerous times but the most weight she ever lost was 75 lbs, which she regained over a two-year period. She had recently reached her highest weight of 434 lbs, but since beginning the preoperative nutrition education program she has lost 24 lbs.

Objectives

After completing this case, the student will be able to:

1. Identify criteria that allow an individual to qualify as a candidate for bariatric surgery.
2. Research and outline the health risks associated with morbid obesity.
3. Identify the current surgical procedures used for bariatric surgery.
4. Describe the potential physiological changes and nutrition problems that may occur after bariatric surgery.
5. Interpret nutrition assessment data to assist with the design of measurable goals, interventions, and strategies for monitoring and evaluation that address the nutrition diagnoses for the patient.
6. Understand current nutrition therapy guidelines for progression of oral intake after bariatric surgery.
7. Demonstrate ability to assess for micronutrient deficiencies with recommendations for treatment.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Turner, Bethany *Female, 37 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 703* **Physician:** *P. Walker* **Admit Date:** *2/23*

iStock.com/drbimages

Patient Summary: Patient is a morbidly obese 37-year-old African American female who is admitted for Roux-en-Y gastric bypass surgery scheduled for 2/24. Patient has been obese her entire adult life, with highest weight six months ago at 434 lbs. She has lost 24 lbs while attending the preoperative nutrition program at our clinic.

History:

Onset of disease: Lifelong obesity
Medical history: T2DM, hypertension, hyperlipidemia, osteoarthritis
Surgical history: R total knee replacement 3 years previous
Medications at home: Metformin 1000 mg/twice daily; 35 u glargine pm; furosemide 25 mg/day; Lovastatin 60 mg/day
Tobacco use: None
Alcohol use: Socially, 2–3 glasses of wine per week
Family history: Father: T2DM, CAD, Htn, COPD; Mother: T2DM, CAD, osteoporosis

Demographics:

Marital status: Married
Number of children: 0
Years education: Bachelor's degree
Language: English only
Occupation: Office manager for real estate office
Hours of work: 8–5 daily, sometimes on weekend
Household members: Lives with husband
Ethnicity: African American
Religious affiliation: Christian-African Methodist Episcopal Church

Admitting History/Physical:

Chief complaint: "I am here for weight-loss surgery."
General/Constitutional: Well-developed, well-nourished obese female, no acute distress.
HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: oral mucosa pink, dentition in good repair
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.
Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops. Diminished distal pulses.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants. No masses, no organomegaly. No guarding, rebound, or CVA tenderness.
Extremities: Normal range of motion in all four extremities. No cyanosis or clubbing. Ecchymosis, abrasions, and pinpoint petechiae present, 2+ pitting edema.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Turner, Bethany *Female, 37 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 703* **Physician:** *P. Walker* **Admit Date:** *2/23*

Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Skin is warm and dry. Patient is not diaphoretic.

Vital Signs: Temp: 98.9°F Pulse: 85 Resp rate: 23
BP: 135/90 Height: 5'8" Weight: 410 lbs

Nursing Assessment	2/23
Abdominal appearance (concave, flat, rounded, obese, distended)	obese
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	lt brown
Stool consistency	formed
Tubes/ostomies	NA
Genitourinary	
Urinary continence	yes
Urine source	clean catch
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	clear, yellow
Integumentary	
Skin color	WNL
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	W
Skin turgor (good, fair, poor, TENT=tenting)	good
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	EC, A, R
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18=no risk, 15–16=low risk, 13–14=moderate risk, ≤12=high risk)	15

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Turner, Bethany *Female, 37 y.o.*

Allergies: *NKA*	**Code:** *FULL*	**Isolation:** *None*
Pt. Location: *RM 703*	**Physician:** *P. Walker*	**Admit Date:** *2/23*

Orders:
Vital signs, Routine, Every 4 hours
CBC with differential, comprehensive metabolic profile; PT/PTT; EKG; Urinalysis
NPO after midnight

Nutrition:
Meal type: NPO
Intake % of meals: NPO
Fluid requirement: 1800–2000 mL

MD Progress Note:
2/24
Subjective: Bethany Turner's previous 24 hours reviewed

Vitals: Temp: 98.9°F Pulse: 78 Resp rate: 24 BP: 115/70
Urine output: 2230 mL POC Glu: 145

Physical Exam
HEENT: WNL
Neck: WNL
Heart: WNL
Lungs: Clear to auscultation
Abdomen: Obese, soft, some epigastric tenderness +BS × 4

Assessment/Plan:
POD#1 s/p Roux-en-Y gastric surgery—now with positive bowel sounds. Will progress to Stage 1 Bariatric Surgery Diet. If tolerated, discharge to home after nutrition consult. Schedule for postoperative visit in one week.

..... P. Walker, MD

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Turner, Bethany *Female, 37 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 703* **Physician:** *P. Walker* **Admit Date:** *2/23*

Intake/Output 410 = 186.3636

Date		**2/23 0701–2/24 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**0**	**60**	**100**	**160**
	I.V.	**680**	**680**	**680**	**2040**
	(mL/kg/hr)	(0.45)	(0.45)	(0.45)	(0.45)
	I.V. piggyback	**0**	**0**	**0**	**0**
	TPN	**0**	**0**	**0**	**0**
	Total intake	**680**	**740**	**780**	**2200**
	(mL/kg)	(3.6)	(3.9)	(4.2)	(11.8)
OUT	Urine	**700**	**710**	**820**	**2230**
	(mL/kg/hr)	(0.47)	(0.47)	(0.55)	(0.50)
	Emesis output	**0**	**0**	**0**	**0**
	Other	**0**	**0**	**0**	**0**
	Stool	**0**	**0**	**0**	**0**
	Total output	**700**	**710**	**820**	**2230**
	(mL/kg)	(3.7)	(3.8)	(4.4)	(12.0)
Net I/O		**−20**	**+30**	**−40**	**−30**
Net since admission (2/23)		**−20**	**+10**	**−30**	**−30**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Turner, Bethany *Female, 37 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 703* **Physician:** *P. Walker* **Admit Date:** *2/23*

Laboratory Results

	Ref. Range	2/23 1522	Six months post-op
Chemistry			
Sodium (mEq/L)	136–145	138	139
Potassium (mEq/L)	3.5–5.1	5.0	4.8
Chloride (mEq/L)	98–107	99	101
Carbon dioxide (mEq/L)	23–29	27	25
BUN (mg/dL)	6–20	15	16
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	0.9	0.8
BUN/Crea ratio	10.0–20.0	16.7:1	20:1
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.2	5.3
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	95	
Glucose (mg/dL)	70–99	145 ↑	101 ↑
Phosphate, inorganic (mg/dL)	2.2–4.6	3.9	3.1
Magnesium (mg/dL)	1.5–2.4	2.0	1.9
Calcium (mg/dL)	8.6–10.2	9.5	9.2
Osmolality (mmol/kg/H_2O)	275–295	289	293
Bilirubin total (mg/dL)	≤1.2	0.8	
Bilirubin, direct (mg/dL)	<0.3	0.07	
Protein, total (g/dL)	6–7.8	6.8	
Albumin (g/dL)	3.5–5.5	4.2	
Prealbumin (mg/dL)	18–35	22	
Ammonia (µmol/L)	6–47	11	
Alkaline phosphatase (U/L)	30–120	118	
ALT (U/L)	4–36	21	
AST (U/L)	0–35	10	
CPK (U/L)	30–135 F 55–170 M	220 !↑	
Lactate dehydrogenase (U/L)	208–378	276	
Cholesterol (mg/dL)	<200	320 !↑	210 ↑
HDL-C (mg/dL)	>50 F, >40 M	32 !↓	45 !↓
VLDL (mg/dL)	7–32	45 !↑	

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Turner, Bethany *Female, 37 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 703* **Physician:** *P. Walker* **Admit Date:** *2/23*

Laboratory Results *(Continued)*

	Ref. Range	2/23 1522	Six months post-op
LDL (mg/dL)	0–99	232 !↑	135 ↑
LDL/HDL ratio	<4.5	7.5 !↑	3.0
Triglycerides (mg/dL)	<150	245 !↑	150 ↑
T_4 (µg/dL)	5–12	6.1	
T_3 (µg/dL)	75–98	82	
HbA_{1C} (%)	<5.7	7.2 !↑	6.1 ↑
Coagulation (Coag)			
PT (sec)	11–13	12	
INR	0.9–1.1	0.95	
PTT (sec)	24–34	26	
Hematology			
WBC ($\times 10^3/mm^3$)	3.9–10.7	10.2	
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	5.5	
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	12.5	10.5 ↓
Hematocrit (Hct, %)	37–47 F 41–51 M	38	35 ↓
Mean cell volume (μm^3)	80–96	82	
Mean cell Hgb (pg)	28–32	29	
Mean cell Hgb content (g/dL)	32–36	33	
RBC distribution (%)	11.6–16.5	12.3	
Platelet count ($\times 10^3/mm^3$)	150–350	261	
Transferrin (mg/dL)	250–380 F 215–365 M	279	395 ↑
Ferritin (mg/mL)	20–120 F 20–300 M	76	19 ↓
Iron (µg/dL)	65–165 F 75–175 M	110	
Total iron binding capacity (µg/dL)	240–460	269	

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Turner, Bethany *Female, 37 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 703* **Physician:** *P. Walker* **Admit Date:** *2/23*

Laboratory Results *(Continued)*

	Ref. Range	2/23 1522	Six months post-op
Iron saturation (%)	15–50 F 10–50 M	15	
Vitamin B_{12} (ng/dL)	200–900	450	150 !↓
Methylmalonic acid (nmol/mL)	<0.4	0.2	0.7 !↑
Folate (ng/dL)	5–25	15	13
25(OH) Vitamin D (ng/mL)	30-100	34	11 !↓
PTH (pg/mL)	10-65	44	82 !↑
Urinalysis			
Collection method	---	clean catch	
Color	---	yellow	
Appearance	---	clear	
Specific gravity	1.001–1.035	1.004	
pH	5–7	6.1	
Protein (mg/dL)	Neg	Neg	
Glucose (mg/dL)	Neg	Neg	
Ketones	Neg	Neg	
Blood	Neg	Neg	
Bilirubin	Neg	Neg	
Nitrites	Neg	Neg	
Urobilinogen (EU/dL)	<1.0	0	
Leukocyte esterase	Neg	Neg	
Prot chk	Neg	Neg	
WBCs (/HPF)	0–5	0	
RBCs (/HPF)	0–2	0	
Bact	0	0	
Mucus	0	0	
Crys	0	0	
Casts (/LPF)	0	0	
Yeast	0	0	

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal," and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. Define the BMI criteria for the classification of obesity. What BMI is associated with morbid obesity?

2. List 10 health risks involved with untreated morbid obesity. What health risks does Mrs. Turner present?

3. What are the standard adult criteria for consideration as a candidate for bariatric surgery? After reading Mrs. Turner's medical record, determine the criteria that support her qualifications for surgery.

4. By conducting an Internet search or literature review, find one example of a bariatric surgery program. Describe the information that is provided for the patient regarding qualification for surgery. Outline the personnel involved in the evaluation and care of the patient in this particular program.

5. Describe the following surgical procedures used for bariatric surgery, including advantages, disadvantages, and potential complications.

a. Roux-en-Y gastric bypass

b. Vertical sleeve gastrectomy

c. Adjustable gastric banding (Lap-Band®)

d. Vertical banded gastroplasty

e. Duodenal switch

f. Biliopancreatic diversion

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

6. Mrs. Turner has had type 2 diabetes for several years. Her physician shared with her that after surgery she will not be on any medications for her diabetes and that she may be able to stop her medications for diabetes altogether. Describe the proposed effect of bariatric surgery on the pathophysiology of T2DM. What, if any, other medical conditions might be affected by weight loss?

7. Mrs. Turner's surgical team uses an enhanced recovery after surgery (ERAS) protocol for their bariatric surgery patients. What is this and how might this impact Mrs. Turner's postoperative recovery?

II. Understanding the Nutrition Therapy

8. How does the Roux-en-Y procedure affect digestion and absorption? Do other surgical procedures discussed in question #5 have similar effects?

9. On post-op day one, Mrs. Turner was advanced to the Stage 1 Bariatric Surgery Diet. This consists of water, sugar-free beverages, diluted fruit juices, chicken or beef broth, and sugar-free gelatin. Instructions are to drink 1-oz portions over 30-minute periods. What is the rationale for avoiding sugared beverages and limiting the portion sizes?

10. Over the next two months, Mrs. Turner will be progressed to a pureed-consistency diet with 6–8 small meals. Describe the major goals of this diet for the Roux-en-Y patient. How might the nutrition guidelines differ if Mrs. Turner had undergone a Lap-Band® procedure?

11. Mrs. Turner's RD has discussed the importance of hydration, protein intake, and intakes of vitamins and minerals, especially calcium, vitamin D, iron, and B_{12}. For each of these nutrients, describe why a deficiency may occur and explain the potential complications that could result from deficiency. Are there other potential risks for micronutrient deficiency?

12. Metabolic bone disease has been noted as a long-term complication following bariatric surgery. Why? How would this be assessed? How can it be prevented?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

III. Nutrition Assessment

13. Assess Mrs. Turner's height and weight. Calculate her BMI and % usual body weight. What would be a reasonable weight goal for Mrs. Turner? Give your rationale for the method you used to determine this goal weight.

14. After reading the physician's history and physical, identify any signs or symptoms that are most likely a consequence of Mrs. Turner's morbid obesity.

15. Identify any abnormal biochemical indices and discuss the probable underlying etiology. How might they change after weight loss?

16. Mrs. Turner's serum vitamin D level was low post-operatively. What is the potential etiology for this deficiency? What would be the recommended treatment post-operatively?

17. Determine Mrs. Turner's energy and protein requirements to promote weight loss. Explain the rationale for the method you used to calculate these requirements.

IV. Nutrition Diagnosis

18. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

19. Determine the appropriate progression of Mrs. Turner's post–bariatric-surgery diet. Include recommendations for any supplementation that should be prescribed.

20. Describe any pertinent lifestyle changes that you would view as a priority for Mrs. Turner.

21. How would you assess Mrs. Turner's readiness for a physical activity plan? How does exercise assist in weight loss after bariatric surgery?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

VI. Nutrition Monitoring and Evaluation

22. Identify the steps you would take to monitor Mrs. Turner's nutritional status postoperatively.

23. From the literature, what is the success rate of bariatric surgery? What patient characteristics may increase the likelihood for success?

24. Mrs. Turner asks you about the possibility of bariatric surgery for a young cousin who is 10 years old. What are the criteria for bariatric surgery in children and adolescents?

25. Write an ADIME note for your inpatient nutrition assessment with initial education for the Stage 1 and 2 (liquid) diet for Mrs. Turner.

26. Six months after surgery, Mrs. Turner presents to her surgical follow-up. Evaluate those biochemical indices. Identify any abnormalities and discuss your potential recommended interventions.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Ahmed OS, Rogers AC, Bolger JC, et al. Meta-analysis of enhanced recovery protocols in bariatric surgery. *J Gastrointest Surg*. 2018;22:964–972.

Al-Mutawa A, Anderson AK, Alsabah S, Al-Mutawa M. Nutritional status of bariatric surgery candidates. *Nutrients*. 2018;10:67–78. doi: 10.3390/nu100110067

American Diabetes Association. Obesity management for the treatment of type 2 diabetes: Standards of medical care in diabetes—2020. *Diabetes Care*. 2020;43:S89–S97.

Bariatric surgery. Nutritioncaremanual.org. https://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=1&lv 1=5545&lv2 =16927&ncm_toc_id=16927. Accessed January 14, 2020.

Ben-Porat T, Wlazary R, Sherf-Dagan S, et al. Bone health following bariatric surgery: Implications for management strategies to attenuate bone loss. *Adv Nutr*. 2018;9:114–127.

Bond DS, Thomas JG, King WC, et al. Exercise improves quality of life in bariatric surgery candidates: Results from the Bari-Active Trial. *Obesity*. 2015;23:536–542.

Borges JLC, de M. Miranda IS, Sarquis MMS, et al. Obesity, bariatric surgery and vitamin D. *J Clin Densitometry*. 2018;21:157–162.

Dagan SS, Goldenshluger A, Globus I, et al. Nutritional recommendations for adult bariatric surgery patients: Clinical practice. *Adv Nutr*. 2017;8:382–394.

Egberts K, Brown WA, Brennan L, O'Brien PE. Does exercise improve weight loss after bariatric surgery? A systematic review. *Obes Surg*. 2012;22:335–341.

Frame-Peterson LA, Megill RD, Carobrese S, Schweitzer M. Nutrient deficiencies are common prior to bariatric surgery. *Nutr Clin Pract*. 2017;32:463–469.

Garvey WT, Mechanick JL, Brett EM, et al. American Association of Clinical Endocrinologists and American College of Endocrinology comprehensive clinical practice guidelines for medical care of patients with obesity. *Endocr Pract*. 2016;22:843–884.

Ikramuddin S, Korner J, Lee WJ, et al. Lifestyle intervention and medical management with vs without Roux-en-Y gastric bypass and control of hemoglobin A1c, LDL cholesterol, and systolic blood pressure at 5 years in the diabetes surgery study. *JAMA*. 2018;319(3):266–278.

Kalarchian M, Turk M, Elliott J, Gourash W. Lifestyle management for enhancing outcomes after bariatric surgery. *Curr Diab Rep*. 2014;14:530–539.

Marcotte E, Chand B. Management and prevention of surgical and nutritional complications after bariatric surgery. *Surg Clin N Am*. 2016;96:843–56.

Nahikian-Nelms ML. Diseases and disorders of energy imbalance. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Wadsworth, Cengage Learning; 2019:254–295.

Parrott J, Frank L, Rabena R, et al. American Society for Metabolic and Bariatric Surgery integrated health nutritional guidelines for the surgical weight loss patient 2016. *Surg Obes Relat Dis*. 2017;13:727–741.

Patel JJ, Mundi MS, Hurt RT, et al. Micronutrient deficiencies after bariatric surgery: An emphasis on vitamins and trace minerals. *Nutr Clin Pract*. 2017;32:471–480.

Pratt JSA, Browne A, Browne T, et al. ASMBS pediatric metabolic and bariatric surgery guidelines. *Surg Obes Rel Dis*. 2018;14:882–901.

Rubino F, Nathan DM, Eckel RH, et al. Metabolic surgery in the treatment algorithm for type 2 diabetes: A joint statement by international diabetes organizations. *Diabetes Care*. 2016;39(6):861–877.

Styne DM, Arslanian SA, Connor EL, et al. Pediatric obesity—assessment, treatment and prevention: An Endocrine Society clinical practice guideline. *J Clinc Endocrinol Metab*. 2017;102:709–757.

Tang L, Alsulaim HA, Canner JK, Prokopowicz GP, Steele KE. Prevalence and predictors of postoperative thiamine deficiency after vertical sleeve gastrectomy. *Surg Obes Relat Dis*. 2018;14:943–951.

Thorell A, MacCormick AD, Awad S, et al. Guidelines for perioperative care in bariatric surgery (ERAS) Society recommendations. *World J Surg*. 2016;40:2065–2083.

Via MA, Mechanick JL. Nutritional and micronutrient care of bariatric surgery patients: Current evidence update. *Curr Obes Rep*. 2017;6:286–296.

Internet Resources

American Society for Metabolic and Bariatric Surgery: http://ASMBS.org

Bariatric Eating: www.bariatriceating.com

Lapband: www.lapband.com

Nutrition Care Manual: http://www.nutritioncaremanual.org (requires membership)

Obesity Help: www.obesityhelp.com

Realize: https://www.jnjmedicaldevices.com/en-IN/realize-coming-soon?fbclid=IwAR38LKbGOh-DFHb6dv4zgF0OWlIf3izV4_2SDGQO_gCifWOcEVzm1ax8yVc

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 3

Malnutrition Associated with Chronic Disease

Harry Campbell is a 68-year-old male recently discharged from the ED with dehydration, weight loss, generalized weakness, and malnutrition.

Objectives

After completing this case, the student will be able to:

1. Identify the signs and symptoms associated with malnutrition using an NFPE.
2. Discern the physiological differences among starvation, chronic disease-related malnutrition, and acute disease-related malnutrition.
3. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses for this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Campbell, Harry, *Male, 68 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Primary Care Clinic* **Physician:** *F. Connors* **Appointment Date:** *1/31*

sebra/Shutterstock.com

Patient Summary: Harry Campbell is a 68-year-old male who presented to the ED two days ago with dehydration, weight loss, generalized weakness, and malnutrition. He was given IVFs and referred back to his primary care physician, Dr. Connors, for management. An RDN referral was placed for evaluation and treatment of malnutrition.

History:

Onset of disease: Patient was diagnosed with squamous cell carcinoma of tongue five years ago. Patient previously treated with radiation therapy—no treatment × 3 years.
Medical history: Essential hypertension; hyperlipidemia; weight loss; primary tongue squamous cell carcinoma five years previous; peripheral vascular disease
Surgical history: s/p partial glossectomy five years ago
Medications at home: docusate prn; atorvastatin 80 mg daily; fosinopril 10 mg daily; daily multivitamin
Tobacco use: 1 ppd for 60-plus years
Alcohol use: 1–3 cans of beer per day
Family history: Mother died of pneumonia; father died of lung cancer.

Demographics:

Marital status: Married, lives with wife; *Spouse name*: Carol
Number of children: 2—alive, ages 42 and 45
Years education: 9 years
Language: English only
Occupation: Electrician for 26 years; retired
Hours of work: N/A
Household members: Wife and patient
Ethnicity: Caucasian
Religious affiliation: Baptist

MD Progress Note:

Vital Signs:

Temp: 96.6°F	Pulse: 101	Resp rate: 20
BP: 122/77	Height: 6'3"	Weight: 156 lbs

HEENT: Head: noted temporal wasting
Eyes: PERRLA
Ears: clear
Nose: dry mucous membranes
Throat: dry mucous membranes without exudates or lesions

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Campbell, Harry, *Male, 68 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Primary Care Clinic* **Physician:** *F. Connors* **Appointment Date:** *1/31*

Cardiac: Regular rate and rhythm
Pulmonary/chest: Respirations are shallow—clear to auscultation and percussion
Abdominal: Hypoactive bowel sounds × 4; nontender, nondistended
Extremities: Decreased muscle tone with normal ROM; loss of lean mass noted quadriceps and gastrocnemius; 1+ pedal edema. Diminished pulses bilaterally.
Neurological: Alert and oriented; strength reduced
Skin: Warm and dry with ecchymoses
Psychiatric: Negative

Medications:
Multivitamin capsule 1 cap daily
Docusate capsule 100 mg twice daily
Atorvastatin 80 mg daily
Fosinopril 10 mg daily

Assessment and Plan: 68 y.o. male here after recent discharge from ED for dehydration, weight loss, generalized weakness, and malnutrition. Pt c/o early satiety and poor appetite.

Dx: R/O recurrent cancer

Medical Tx plan: Repeat PET scan. Referral to RDN to evaluate malnutrition and develop treatment plan.

..... F. Connors, MD

Nutrition:
History: Patient states that he has lost over 60 lbs in the past 1–2 years. He lost some weight when diagnosed with cancer 5 years ago, but held steady at approximately 220 lbs even after completing radiation therapy until 1–2 years ago, when he began losing weight. He states that he gets full very easily and never feels hungry.
Usual intake (for past several months): AM—egg, coffee, few bites of toast; 10 am—½ can Ensure Enlive; lunch—soup or ½ sandwich, milk; dinner—few bites of soft meat, potatoes or rice. Tries to drink the other ½ can of Ensure Enlive. Follows an IDDSI level 6 diet with <5% of meals consumed. Takes sips of liquids.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Campbell, Harry, *Male, 68 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Primary Care Clinic* **Physician:** *F. Connors* **Appointment Date:** *1/31*

Laboratory Results

	Ref. Range	1/31
Chemistry		
Sodium (mEq/L)	136–145	146 ↑
Potassium (mEq/L)	3.5–5.1	4.3
Chloride (mEq/L)	98–107	106
Carbon dioxide (mEq/L)	23–29	29
BUN (mg/dL)	6–20	24 ↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.4 ↑
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	4.5
Glucose (mg/dL)	70–99	71
Phosphate, inorganic (mg/dL)	2.2–4.6	2.4
Magnesium (mg/dL)	1.5–2.4	1.9
Calcium (mg/dL)	8.6–10.2	8.4 ↓
Osmolality (mmol/kg/H_2O)	275–295	299 ↑
Protein, total (g/dL)	6–7.8	5.8 ↓
Albumin (g/dL)	3.5–5.5	1.8 ↓
Prealbumin (mg/dL)	18–35	9 ↓
Ammonia (µg/L)	6–47	11
Alkaline phosphatase (U/L)	30–120	75
ALT (U/L)	4–36	31
AST (U/L)	0–35	24
CPK (U/L)	30–135 F 55–170 M	88
Cholesterol (mg/dL)	<200	112
HDL-C (mg/dL)	>50 F, >40 M	24 ↓
VLDL (mg/dL)	7–32	22
LDL (mg/dL)	0–99	66
LDL/HDL ratio	<4.5	2.75
Triglycerides (mg/dL)	<150	112
T_4 (µg/dL)	5–12	5.8

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Campbell, Harry, *Male, 68 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Primary Care Clinic* **Physician:** *F. Connors* **Appointment Date:** *1/31*

Laboratory Results *(Continued)*

	Ref. Range	1/31
T_3 (µg/dL)	75–98	81
HbA_{1C} (%)	<5.7	5.3
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	10.3
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	2.4 ↓
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	9.1 ↓
Hematocrit (Hct, %)	37–47 F 41–51 M	27.1 ↓
Mean cell volume (μm^3)	80–96	100.6 ↑
Mean cell Hgb (pg)	28–32	33.6 ↑
Mean cell Hgb content (g/dL)	32–36	33
RBC distribution (%)	11.6–16.5	18 ↑
Platelet count ($\times 10^3/mm^3$)	150–350	240
Transferrin (mg/dL)	250–380 F 215–365 M	380
Ferritin (mg/mL)	20–120 F 20–300 M	20
Vitamin B_{12} (ng/mL)	200–900	350
Methylmelonic acid (nmol/mL)	<0.4	0.7 ↑
Hematology, Manual Diff		
Neutrophil (%)	40–70	55
Lymphocyte (%)	22–44	23
Monocyte (%)	0–7	4
Eosinophil (%)	0–5	0
Basophil (%)	0–2	0
Blasts (%)	3–10	4
Segs (%)	0–60	45
Bands (%)	0–10	10

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal," and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. Outline the metabolic changes that occur during starvation/inadequate nutritional intake (not related to disease) that could result in weight loss.

2. Read the consensus statement of the AND/ASPEN: Characteristics recommended for the identification and documentation of adult malnutrition. Explain the differences between malnutrition associated with chronic disease and malnutrition associated with acute illness and inflammation.

3. Find the current definitions of malnutrition in the United States using the ICD-10 codes. List all the definitions and describe the criteria for one of the diagnoses.

4. Current ICD definitions of malnutrition use biochemical markers as a component of the diagnostic criteria. Explain the effect of inflammation on visceral proteins and how that may impact the clinician's ability to diagnose malnutrition. What laboratory values may confirm the presence of inflammation?

II. Understanding the Nutrition Therapy

5. Mr. Campbell follows an IDDSI level 6 diet. Describe the dietary characteristics associated with this diet order.

6. What is the Ensure Enlive® supplement that was ordered? Determine additional options for Mr. Campbell that would be appropriate for a high-calorie, high-protein beverage supplement.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

III. Nutrition Assessment

7. Assess Mr. Campbell's height and weight. Calculate his BMI and % usual body weight.

8. After reading the physician's history and physical, identify any signs or symptoms that support the diagnosis of malnutrition using the proposed definitions of malnutrition by AND/ASPEN malnutrition guidelines.

9. Evaluate Mr. Campbell's NFPE. What important factors noted in his nutrition assessment may support the diagnosis of malnutrition?

10. Identify any signs (including laboratory values) or symptoms from the physician's history and the NFPE that are consistent with dehydration.

11. Identify any signs (including laboratory values) or symptoms from the physician's history and the NFPE that are consistent with vitamin and/or mineral abnormalities.

12. Determine Mr. Campbell's energy and protein requirements. Explain the rationale for the method you used to calculate these requirements.

13. Determine Mr. Campbell's fluid requirements. Compare this with the information collected from his usual dietary intake.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

14. From the nutrition history, assess Mr. Campbell's usual dietary intake. How does this compare to the requirements that you calculated for him? Can your evaluation of his dietary intake contribute to the evidence for diagnosing malnutrition?

Nutrition Focused Physical Exam

	Physical Findings:
Body Region:	
Hair	Dull
Temporal region	Moderate depletion
Orbital region	Moderate depletion
Eyes	WNL
Nose	Dry mucous membranes with petechiae
Lips	WNL
Mouth	Pallor, dry mucous membranes without exudates or lesions
Tongue/hypoglossal nerve/ glossopharyngeal	Color WNL, partial glossectomy noted, poor range of motion
Teeth	WNL
Gums	Dry
Trigeminal nerve/ facial nerve	WNL
Neck	WNL
Clavicle bone region	Moderate depletion
Acromion/ shoulders	Mild depletion
Triceps	WNL
Ribs/lower back/midaxillary line	Moderate depletion
Scapular region	Mild depletion
Interosseous muscle	WNL
Nails	WNL
Quadriceps	Mild depletion
Gastrocnemius	Mild depletion
Edema	1+ pedal edema
Skin	Warm and dry with ecchymosis, poor skin turgor

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

IV. Nutrition Diagnosis

15. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

16. Determine the appropriate intervention for each nutrition diagnosis.

VI. Nutrition Monitoring and Evaluation

17. Identify the steps you would take to monitor Mr. Campbell's nutritional status.

18. Write your ADIME note for this initial nutrition assessment for Mr. Campbell.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Danis K, Kline M, Munson M, et al. Identifying and managing malnourished hospital patients using the Malnutrition Quality Improvement Initiative: The UPMC experience. *J Acad Nutr Diet*. 2019; 119:S40–S43.

Esper DH. Utilization of nutrition-focused physical assessment in identifying micronutrient deficiencies. *Nutr Clin Pract*. 2015;30:194–202.

Giannopoulous GA, Merriman LR, Ramsey A, Zweibel DS. Malnutrition coding 101: Financial impact and more. *Nutr Clin Pract*. 2013;28:698–709.

Gropper S, Smith JL, Carr TP. Energy expenditure, body composition, and healthy weight. In *Advanced Nutrition and Human Metabolism*. 7th ed. Boston, MA: Cengage Learning; 2018:273–298.

Jensen GL, Mirtallo J, Compher C, et al. Adult starvation and disease related malnutrition: A proposal for etiology-based diagnosis in the clinical practice setting from the International Consensus Guideline Committee. *Clinical Nutrition*. 2010; 29:151–153.

Malone A, Hamilton C. The Academy of Nutrition and Dietetics/The American Society for Parenteral and Enteral Nutrition Consensus Malnutrition Characteristics: Application in practice. *Nutr and Clin Pract*. 2013;28:639–650.

Mogensen KM, Malone A, Becker P, et al. Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition Consensus Malnutrition Characteristics: Usability and association with outcomes. *Nutr and Clin Pract*. 2019;34:657–665.

Mordarski B, Wolff J. *Nutrition Focused Physical Exam: Pocket Guide*. 2nd ed. Chicago: Academy of Nutrition and Dietetics; 2017.

Nahikian-Nelms ML. Metabolic stress and the critically ill. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:674–700.

Nahikian-Nelms ML. Nutrition assessment: Foundation of the nutrition care process. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:38–75.

Nicolo M, Compher C, Still C, Huseini M, Dayton S, Jensen GL. Feasibility of accessing data in hospitalized patients to support the diagnosis of malnutrition by the Academy-ASPEN malnutrition consensus recommended clinical characteristics. *Nutr Clin Pract*. 2013;28:639–650.

Tappendan KA, Quatrara B, Parkhurst ML, Malone AM, Fanjang G, Zeigler TR. Critical role of nutrition in improving quality of care: An interdisciplinary call to action to address adult hospital malnutrition. *JPEN*. 2013;17:482–497.

Weiss AJ, Fingar KR, Barrett ML, et al. Characteristics of hospital stays involving malnutrition, 2013. Healthcare Cost and Utilization Project. 2016.

White JV, Guenter P, Jensen G, Malone A, Schofield M, Academy of Nutrition and Dietetics Malnutrition Work Group, A.S.P.E.N. Malnutrition Task Force, A.S.P.E.N. Board of Directors. Consensus statement of the Academy of Nutrition and Dietetics/American Society of Parenteral and Enteral Nutrition: Characteristics recommended for the identification and documentation of adult malnutrition. *J Acad Nutr Diet*. 2012;112:730–738.

Internet Resources

Academy of Nutrition and Dietetics. What is the nutrition focused physical exam. https://www.eatright.org/food/nutrition/healthy-eating/what-is-the-nutrition-focused-physical-exam

Alliance to Advance Patient Nutrition: http://malnutrition.com

AND Evidence Analysis Library: http://www.andeal.org

ASPEN Malnutrition Toolkit: https://www.nutritioncare.org/Guidelines_and_Clinical_Resources/Toolkits/Malnutrition_Toolkit/

Centers for Medicare and Medicaid Services, ICD 10: http://cms.gov/Medicare/Coding/ICD10/index.html

ChooseMyPlate: https://www.choosemyplate.gov

International Dysphagia Diet Standardisation Initiative: iddsi.org

Nutrition Care Manual: http://www.nutritioncaremanual.org

Prevention Plus Braden Scale: http://www.bradenscale.com

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Two

NUTRITION THERAPY FOR CARDIOVASCULAR DISORDERS

Cardiovascular disease accounts for over 30% of all deaths in the United States. Researchers estimate that more than an estimated 92.1 million American adults (>1 in 3) live with one or more cardiovascular disease (CVD); as a result, many patients that the health care team encounters will have conditions related to cardiovascular disease. Extensive health care costs for CVD, estimated to be more than $316 billion, provide an important impetus to intervention and treatment with medical nutrition therapy.

This section includes three of the most common diagnoses: hypertension (HTN), myocardial infarction (MI), and heart failure (HF). All these diagnoses require a significant medical nutrition therapy component for their care.

Almost 50% of adults in the United States (108 million people) are diagnosed with hypertension. Stage 1 hypertension is defined as a systolic blood pressure of 130–139 mm Hg and a diastolic pressure of 80–89 mm Hg or higher. Essential hypertension, which is the most common form of hypertension, is of unknown etiology. Case 4 focuses on lifestyle modifications as treatment for hypertension accompanied by dyslipidemia in a female patient. This case incorporates the pharmacological treatment of hypertension, and you will use the well-validated *Dietary Approaches to Stop Hypertension* (DASH) as the evidence-based intervention for medical nutrition therapy. The 2015–2020 *Dietary Guidelines* provide additional support for modification of sodium intake to assist with nutrition therapy. Because cardiovascular disease is a complex, multifactorial condition, Case 4 provides the opportunity to evaluate these multiple risk factors through all facets of nutrition assessment. We specifically emphasize interpretation of laboratory indices for dyslipidemia. In this case, you will also determine the clinical classification and treatment of abnormal serum lipids, explore the use of drug therapy to treat dyslipidemias, and develop appropriate nutrition interventions using nutrition recommendations including the Mediterranean diet.

Case 5 focuses on the acute care of an individual suffering a myocardial infarction (MI). Ischemia of the vessels within the heart results in death of the affected heart tissue. This case lets you evaluate pertinent assessment measures for the individual suffering an MI and then develop an appropriate nutrition care plan for lifestyle behaviors and medical nutrition therapy changes that complement the medical care for prevention of further cardiac deterioration.

Case 6 demonstrates the long-term consequences of cardiovascular disease in a patient suffering from HF. In HF, the heart cannot pump effectively, and the lack of oxygen and nutrients affects the body's tissues. HF is a major public health problem in the United States, and its incidence is increasing. Without a heart transplant, long-term prognosis is poor. This advanced case requires you to integrate understanding of the physiology of several body systems as you address HF's metabolic effects, including cardiac cachexia, with its significant effect on nutritional status.

Case 6 also takes a new approach to the diagnosis of HF. A thiamin deficiency presents as cardiomyopathy resulting in HF. This case uniquely introduces the students to the importance of thiamin delivery in an ICU case or idiopathic HF. These guidelines for thiamin delivery can also be applied to alcoholism. The student should also be able to apply the traditional MNT for HF with sodium and fluid restrictions. An introduction to ABGs is presented to guide discussion of the risk of acid/base imbalance in heart disease.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 4

Hypertension and Cardiovascular Disease

Mrs. Margaret Moore is a 57-year-old retired nurse. For the past year, she has treated her newly diagnosed hypertension with lifestyle changes including diet, smoking cessation, and exercise. She is here to see her physician in the outpatient clinic for further evaluation and treatment for essential hypertension. Blood drawn two weeks prior to this appointment shows an abnormal lipid profile.

Objectives

After completing this case, the student will be able to:

1. Describe the physiology of blood pressure regulation.
2. Apply knowledge of the pathophysiology of hypertension and dyslipidemia to identify and explain common nutritional problems associated with these diseases.
3. Explain the role of nutrition therapy as an adjunct to pharmacotherapy, surgery, and other medical treatments of cardiovascular disease.
4. Interpret laboratory parameters for nutritional implications and significance.
5. Analyze nutrition assessment data to evaluate nutritional status and identify specific nutrition problems.
6. Determine nutrition diagnoses and write appropriate PES statements.
7. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Moore, Margaret *Female, 57 y.o.*
Allergies: *No known allergies* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *University Clinic* **Physician:** *R. Evans* **Appointment Date:** *6/25*

iStock.com/drbimages

Patient Summary: 57-year-old female here for evaluation and treatment for essential hypertension and hyperlipidemia.

History:

Onset of disease: Mrs. Moore is a 57-year-old female who is a retired nurse. She was diagnosed 1 year ago with Stage 1 (essential) HTN. Treatment thus far has included only lifestyle behavior interventions. She began a walking program resulting in a 10-pound weight loss that she has been able to maintain during the past year. She walks 30 minutes 4–5 times per week, though she sometimes misses on weekends and on nights when she is volunteering for her church. She was given a nutrition information pamphlet in the MD office outlining a lower-Na diet at this initial visit. Mrs. Moore was a 2-pack-a-day smoker but quit ("cold turkey") when her HTN was diagnosed last year. No c/o of any symptoms related to HTN. Pt denies chest pain, SOB, syncope, palpitations, or myocardial infarction.
Medical history: Not significant before Dx of HTN
Surgical history: None
Medications at home: None
Tobacco use: No—quit 1 year ago
Alcohol use: 2–4 beers/wk
Family history: What? HTN. Who? Mother died of MI related to uncontrolled HTN.

Demographics:

Marital status: Married; *Spouse name:* Steve Moore, 60 y.o.
Number of children: Children are grown and do not live at home.
Years education: College degree
Language: English
Occupation: No employment outside of home—retired nurse
Hours of work: Varies—volunteers several times per month
Household members: 2
Ethnicity: African American
Religious affiliation: Roman Catholic

MD Progress Note:

Review of Systems
General/Constitutional: Well-developed, well-nourished. No acute distress.
HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: oral mucosa pink, dentition in good repair
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.
Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants. No masses, no organomegaly. No guarding, rebound, or CVA tenderness.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Moore, Margaret *Female, 57 y.o.*
Allergies: *No known allergies* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *University Clinic* **Physician:** *R. Evans* **Appointment Date:** *6/25*

Extremities: Normal range of motion in all four extremities. No cyanosis or clubbing or peripheral edema.
Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Skin is warm and dry. Patient is not diaphoretic. No rashes or ulcerations noted.

Vital Signs: Temp: 98.6°F Pulse: 80 Resp rate: 15
BP: 150/95 Height: 5"6" Weight: 160 lbs BMI: 25.8

Assessment and Plan:

Dx: Stage 2 HTN, heart disease, early COPD; here for evaluation of persistent hypertension with consideration of pharmacologic therapy and reinforcement of lifestyle modifications. R/O metabolic syndrome.

Medical Tx plan: Urinalysis; hematocrit; blood chemistry to include plasma glucose, potassium, BUN, creatinine, fasting lipid profile, triglycerides, calcium, uric acid; chest X-ray; nutrition consult; 25 mg hydrochlorothiazide daily; 2.5 mg Ramipril daily × 1 week; 5 mg Ramipril daily × 3 weeks and then 10 mg Ramipril daily thereafter; evaluate for initiation of HMG-CoA reductase inhibitor therapy; f/u 3 months.

..... R. Evans, MD

Nutrition:
General: Mrs. Moore describes her appetite as "very good." She does the majority of grocery shopping and cooking, although Mr. Moore cooks breakfast on the weekends. She usually eats 3 meals each day, but on her volunteer nights, she may skip dinner. When she does this, she is hungry when she gets home in the late evening, so she often eats a bowl of ice cream before going to bed. Mr. and Mrs. Moore usually eat out on Friday and Saturday evenings at pizza restaurants or steakhouses (Mrs. Moore usually has 2 regular beers or 2 glasses of wine with these meals). She mentions that last year when her HTN was diagnosed, the MD's office gave her a sheet of paper with a list of foods to avoid for a lower-salt diet. She states that she certainly is familiar with a low-salt diet from when she practiced as an RN. She and her husband tried to comply with the diet guidelines, but they found the foods bland and tasteless, and they soon abandoned the effort. She has continued to purchase some lower-salt versions of foods when she sees them at the grocery store.

24-hour recall:

AM:	1 c coffee (black)
	Oatmeal (1 instant packet with 1 tsp margarine and 2 tsp sugar)
	1 c orange juice
Snack:	2 c coffee (black)
	1 glazed donut

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Moore, Margaret *Female, 57 y.o.*
Allergies: *No known allergies* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *University Clinic* **Physician:** *R. Evans* **Appointment Date:** *6/25*

Lunch:	1 can Campbell's® tomato bisque soup prepared with milk 10 reduced-salt crackers 1 can diet cola
PM:	6 oz oven-fried chicken (white meat, no skin; seasoned with salt, pepper, garlic) 1 large baked potato with 1 tbsp butter, salt, and pepper 1 c glazed carrots (1 tsp sugar, 1 tsp butter) Dinner salad with ranch-style dressing (3 tbsp)—lettuce, spinach, croutons, sliced cucumber 2 regular beers
HS snack:	2 c buttered popcorn

Food allergies/intolerances/aversions: None
Previous nutrition therapy? Yes. If yes, when: 1 year ago. Where? MD's office.
Food purchase/preparation: Self and husband
Vit/min intake: Multivitamin/mineral daily

Laboratory Results

	Ref. Range	6/25	12/14 (6 mos. later)	3/15 (9 mos. later)
Chemistry				
Sodium (mEq/L)	136–145	137	138	137
Potassium (mEq/L)	3.5–5.1	4.5	3.6	3.9
Chloride (mEq/L)	98–107	102	100	101
Carbon dioxide (mEq/L)	23–29	28	29	29
BUN (mg/dL)	6–20	20	18	19
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	0.9	1.1	1.1
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	3.2	4.1	3.5
Est GFR, Afr-Amer (mL/min/1.73 m^2)	>60	72	70	70
Glucose (mg/dL)	70–99	101 !↑	90	96
Phosphate, inorganic (mg/dL)	2.2–4.6	4.1	3.5	3.5
Magnesium (mg/dL)	1.5–2.4	2.1	2.3	2.4
Calcium (mg/dL)	8.6–10.2	9.2	9.1	9.5
Osmolality (mmol/kg/H_2O)	275–295	294	293	295
Bilirubin total (mg/dL)	≤1.2	1.1	0.8	0.9

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Moore, Margaret *Female, 57 y.o.*
Allergies: *No known allergies* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *University Clinic* **Physician:** *R. Evans* **Appointment Date:** *6/25*

Laboratory Results *(Continued)*

	Ref. Range	6/25	12/14 (6 mos. later)	3/15 (9 mos. later)
Bilirubin, direct (mg/dL)	<0.3	0.1	0.12	0.11
Protein, total (g/dL)	6–7.8	7	6.2	6.9
Albumin (g/dL)	3.5–5.5	4.6	4.5	4.7
Prealbumin (mg/dL)	18–35	32	31	33
Ammonia (µg/L)	6–47	19	18	21
Alkaline phosphatase (U/L)	30–120	120	100	101
ALT (U/L)	4–36	30	35	28
AST (U/L)	0–35	34	31	30
CPK (U/L)	30–135 F 55–170 M	100	125	130
Lactate dehydrogenase (U/L)	208–378	314	323	350
Cholesterol (mg/dL)	<200	270 !↑	230 !↑	210 !↑
HDL-C (mg/dL)	>50 F, >40 M	30 !↓	35 !↓	38 !↓
VLDL (mg/dL)	7–32	30	26	25
LDL (mg/dL)	0–99	210 !↑	169 !↑	147 !↑
LDL/HDL ratio	<4.5	7.0 !↑	4.8 !↑	3.9
Apo A (mg/dL)	80–175 F 75–160 M	75 !↓	100	110
Apo B (mg/dL)	45–120 F 50–125 M	140 !↑	120	115
Triglycerides (mg/dL)	<150	150 !↑	130	125
T_4 (µg/dL)	5–12	8.6	8.5	7.8
T_3 (µg/dL)	75-98	95	92	93
HbA_{1C} (%)	<5.7	4.9	5.0	5.1
Hematology				
WBC ($\times 10^3/mm^3$)	3.9–10.7	6.1	5.7	5.5
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	5.3	5.0	5.25
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	14.2	14.0	13.9

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Moore, Margaret *Female, 57 y.o.*
Allergies: *No known allergies* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *University Clinic* **Physician:** *R. Evans* **Appointment Date:** *6/25*

Laboratory Results *(Continued)*

	Ref. Range	6/25	12/14 (6 mos. later)	3/15 (9 mos. later)
Hematocrit (Hct, %)	37–47 F 41–51 M	45	44	44
Urinalysis				
Collection method	—	rand. spec.	rand. spec.	rand. spec.
Color	—	pale yellow	pale yellow	pale yellow
Appearance	—	clear	clear	clear
Specific gravity	1.001–1.035	1.025	1.021	1.024
pH	5–7	7.0	5.0	6.0
Protein (mg/dL)	Neg	Neg	Neg	Neg
Glucose (mg/dL)	Neg	Neg	Neg	Neg
Ketones	Neg	Neg	Neg	Neg
Blood	Neg	Neg	Neg	Neg
Bilirubin	Neg	Neg	Neg	Neg
Nitrites	Neg	Neg	Neg	Neg
Urobilinogen (EU/dL)	<1.0	0.02	0.01	0.09
Leukocyte esterase	Neg	Neg	Neg	Neg
Prot chk	Neg	Neg	Neg	Neg
WBCs (/HPF)	0–5	0	0	0
RBCs (/HPF)	0–2	0	0	0
Bact	0	0	0	0
Mucus	0	0	0	0
Crys	0	0	0	0
Casts (/LPF)	0	0	0	0
Yeast	0	0	0	0

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. Define arterial blood pressure (BP) and explain how it is measured.

2. Discuss briefly the mechanisms that regulate arterial blood pressure, including the sympathetic nervous system, the renin–angiotensin–aldosterone system (RAAS), and renal function.

3. What is essential hypertension? What is the etiology?

4. What are the common symptoms of essential hypertension?

5. Using the 2018 ACC/AHA guidelines, how is the diagnosis of hypertension made? What blood pressure readings are used to identify normal BP, elevated BP, stage 1 hypertension, and stage 2 hypertension?

6. List the risk factors for developing hypertension. What risk factors does Mrs. Moore currently have? Discuss the contribution of ethnicity to hypertension.

7. What are the four major modes of treatment for hypertension?

8. Dr. Evans indicated in his note that he will "rule out metabolic syndrome." What is metabolic syndrome?

9. What factors found in the medical and social history are pertinent for determining Mrs. Moore's coronary heart disease (CHD) risk category?

10. How is hypertension related to other cardiovascular disorders? What are the possible complications of uncontrolled or untreated hypertension?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

II. Understanding the Nutrition Therapy

11. Briefly describe the DASH eating plan and discuss the major nutrients that are components of this nutrition therapy.

12. Using the 2015–2020 *Dietary Guidelines*, describe why decreased sodium intake is targeted as a focus to improve the health of Americans.

13. What do the current literature and the Evidence Analysis Library (EAL) indicate regarding the role of sodium intake in the control of hypertension? Is there a significant correlation between sodium intake and cardiovascular risk?

14. What is the Mediterranean diet? How might this dietary approach be appropriate for Mrs. Moore? Would this be culturally appropriate for her?

15. Lifestyle modifications reduce blood pressure, enhance the efficacy of antihypertensive medications, and decrease cardiovascular risk. List lifestyle modifications that have been shown to lower blood pressure.

III. Nutrition Assessment

16. What are the health implications of Mrs. Moore's body mass index (BMI)?

17. Calculate Mrs. Moore's energy and protein requirements.

18. Identify the major sources of sodium and saturated fat in Mrs. Moore's diet. Compare her typical diet to the components of the DASH diet.

19. What dietary assessment tools target nutrients or dietary patterns known to be associated with hypertension and CVD risk? How might these be useful in assessing Mrs. Moore's diet?

20. From the information gathered within the intake domain, list possible nutrition problems using the diagnostic terms.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

21. Dr. Evans ordered the laboratory tests listed in the following table. Complete the table with Mrs. Moore's values from 6/25 and the potential cause of any abnormalities.

Parameter	Normal Value	Pt's Value	Potential Risk Factors Supporting Abnormal Labs
Glucose	70–99 mg/dL		
BUN	6–20 mg/dL		
Creatinine	0.6–1.1 mg/dL		
Total cholesterol	<200 mg/dL		
HDL cholesterol	>59 mg/dL		
LDL cholesterol	<130 mg/dL		
Apo A	80–175 mg/dL		
Apo B	45–120 mg/dL		
Triglycerides	35–135 mg/dL		

22. Go to http://cvdrisk.nhlbi.nih.gov/. Using the online calculator, determine Mrs. Moore's risk of CVD based on her lipid profile. Are there other factors that contribute to her CVD risk?

23. How do Mrs. Moore's labs change between 6/25 and 3/15? What factors in her history may have made an impact on these?

24. Indicate the pharmacological differences among the antihypertensive agents listed below.

Medications	Mechanism of Action	Nutritional Side Effects and Contraindications
Diuretics		
Beta-1-blockers		
Beta-blockers, alpha activity		
Calcium-channel blockers		
ACE inhibitors		
Angiotensin II receptor blockers		
Aldosterone inhibitors		

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

25. What are the most common nutritional implications of taking hydrochlorothiazide?

26. Mrs. Moore's physician has decided to prescribe an ACE inhibitor and an HMG-CoA reductase inhibitor (Zocor). What changes to Mrs. Moore's labs between 6/25 and 3/15, if any, would you attribute to Zocor use?

27. From the information gathered within the clinical domain, list possible nutrition problems using the diagnostic terms.

IV. Nutrition Diagnosis

28. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

29. When you talk with Mrs. Moore on 3/15, you ask how much weight she would like to lose. She tells you she would like to weigh 125, which is what she weighed most of her adult life. Is this reasonable? What would you suggest as a goal for weight loss for Mrs. Moore? How quickly should Mrs. Moore lose this weight?

30. For each of the PES statements that you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).

31. List your major recommendations for dietary substitutions and/or other changes that would help Mrs. Moore reach her medical nutrition therapy goals that would be consistent with the DASH diet and sodium intake guidelines.

32. Your appointment with Mrs. Moore on 3/15 is concluded. What would you want to reevaluate at her next follow-up appointment?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

2015–2020 Dietary Guidelines for Americans. dietaryguidelines.gov. https://www.dietaryguidelines.gov/current-dietary-guidelines/2015-2020-dietary-guidelines. Accessed June 27, 2020.

Appel LJ, Brands MW, Daniels SR, et al. Dietary approaches to prevent and treat hypertension: A scientific statement from the American Heart Association. *Hypertension*. 2006;47:296–308.

Arnett DK, Blumenthal RS, Albert MA, et al. 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. 2019;140:596–646.

Chiu S, Bergeron N, Williams PT, Bray GA, Sutherland B, Krauss RM. Comparison of the DASH (dietary approaches to stop hypertension) diet and a higher-fat DASH diet on blood pressure and lipids and lipoproteins: A randomized controlled trial. *Am J Clin Nutr*. 2016;103:341–347.

Elmer PJ, Obarzanek E, Vollmer WM, et al. Effects of comprehensive lifestyle modification on diet, weight, physical fitness, and blood pressure control: 18-month results of a randomized trial. *Ann Intern Med*. 2006;144:485–495.

Facts about hypertension in the United States. cdc.gov.cdc.gov/bloodpressure/facts.htm. Accessed February 11, 2020.

Juraschek SP, Miller ER, Weaver CM, et al. Effects of sodium reduction and the DASH diet in relation to baseline blood pressure. *J Am Coll Cardiol*. 2017;70:2841–2848.

Kovell LC, Ahmed HM, Misra S, et al. US hypertension management guidelines: A review of the recent past and recommendations from the future. *J Am Heart Assoc*. 2015;4(12).

Kraus WE, Bittner V, Appel L, et al. The National Physical Activity Plan: A call to action from the American Heart Association. *Circulation*. 2015;131:1932–1940.

Lennon SL, DellaValle DM, Rodder SG, et al. 2015 Evidence Analysis Library evidence-based nutrition practice guideline for the management of hypertension in adults. *J Acad Nutr Diet*. 2017;117:1445–1458.

Nahikian-Nelms ML. Diseases of the cardiovascular system. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:296–341.

Park YM, Steck SE, Fung TT, et al. Mediterranean diet, dietary approaches to stop hypertension (DASH) style diet, and metabolic health in U.S. adults. *Clin Nutr*. 2017;36:1301–1309.

Pronsky ZM. *Food and Medication Interaction*, 19th ed. Birchrunville, PA: Food-Medication Interactions; 2018.

Sherwood L. The blood vessels and blood pressure. In *Human Physiology*. 9th ed. Boston, MA: Cengage Learning; 2016:335–379.

Whelton PK, Carey RM, Aronow WS, et al. Guideline for the prevention, detection, evaluation, and management of hypertension in adults. *Hypertension*. 2018;71:1269–1324.

Yancy CW, Mariell J, Bozkurt B, et al. 2017 ACC/AHA/HFSA focused update of the 2013 ACCF/AHA guideline for the management of heart failure: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Failure Society of America. *Circulation*. 2017;136(6):e137–161.

Internet Resources

American Heart Association: www.heart.org

AHA/ACC Cardiovascular Risk Calculator: http://www.cvriskcalculator.com/

National Cholesterol Education Program provides clinical guidelines for treatment of dyslipidemia from the NHLBI: www.nhlbi.nih.gov/about/ncep

NHLBI: Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III): www.nhlbi.nih.gov/health-pro/guidelines/current/cholesterol-guidelines

NHLBI: Your Guide to Lowering Your Blood Pressure with DASH: www.nhlbi.nih.gov/health/public/heart/hpb/dash/index/htm

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 5

Myocardial Infarction

José Garcia, a 61-year-old male, is admitted through the ED of University Hospital after experiencing a sudden onset of severe precordial pain on the way home from work. Mr. Garcia is found to have suffered a myocardial infarction and is treated with an emergency angioplasty of the infarct-related artery.

Objectives

After completing this case, the student will be able to:

1. Understand the pathophysiology and initial medical and nutritional care of myocardial infarction.
2. Describe the progression of atherosclerosis and its role in the etiology of myocardial infarction.
3. Interpret laboratory parameters for nutritional implications and significance.
4. Analyze nutrition assessment data to evaluate nutritional status and identify specific nutrition problems.
5. Determine nutrition diagnoses and write appropriate PES statements.
6. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garcia, José, *Male, 61 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 704* **Physician:** *RJ Warren* **Admit Date:** *12/1*

iStock.com/Juanmonino

Patient Summary: José Garcia is a 61-year-old male admitted through the emergency department with diagnosis of STEMI and transferred directly to Cath lab; s/p emergency coronary angiography with angioplasty of the infarct-related artery.

History:

Onset of disease: 61-y.o. male who noted the sudden onset of severe precordial pain on the way home from work. The pain is described as pressure-like pain radiating to the jaw and left arm. The patient has noted an episode of emesis and nausea. He denies palpitations or syncope. He denies prior history of pain. He admits to smoking cigarettes (1 pack/day for 40 years). He denies hypertension, diabetes, or high cholesterol. He denies SOB.
Medical history: Not significant before this admission
Surgical history: Surgery; cholecystectomy 10 years ago, appendectomy 30 years ago
Medications at home: None
Allergies: Sulfa drugs
Tobacco use: 40-year history, 1 pack/day
Alcohol use: 1–2 beers per day
Family history: What? CAD. Who? Father—MI age 59.

Demographics:

Marital status: Married, *Spouse name:* Alicia Garcia, 59 y.o.
Number of children: Daughter and two grandchildren live in the home
Years education: AA degree
Language: English, Spanish
Occupation: IT network specialist
Hours of work: 40/wk
Household members: 5
Ethnicity: Mexican American
Religious affiliation: Catholic

MD Progress Note:

General: Well-developed, overweight male in acute distress from chest pain.
HEENT: Head: normocephalic and atraumatic
Eyes: EOMI, fundoscopic exam WNL. No evidence of atherosclerosis, diabetic retinopathy, or early hypertensive changes.
Mouth: oral mucosa pink, dentition in good repair
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.
Cardiac: Isolated posterior MI with ST depression in V2–3. No murmurs, clicks, or rubs.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants. No masses, no organomegaly. No guarding, rebound, or CVA tenderness. RLQ scar and midline suprapubic scar.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garcia, José, *Male, 61 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 704* **Physician:** *RJ Warren* **Admit Date:** *12/1*

Extremities: Normal range of motion in all four extremities. No cyanosis or clubbing or peripheral edema.
Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Skin is warm and dry. Mild diaphoresis. No rashes or ulcerations noted.

Vital Signs: Temp: 98.6°F Pulse: 94 Resp rate: 23
BP: 140/99 Height: 5'9" Weight: 215 lbs

Orders:
ED: Oxygen 2 liters per NC to maintain O_2 SAT >95%; nitroglycerin 0.4 mg sublingual; aspirin 81 mg × 4 (324 mg total), to be chewed
Heparin 70 units/kg bolus IVP (max dose 7500 units)
Clopidogrel 600 mg oral

Admission to CCU:
Early risk stratification: high risk
Activity: bed rest
Cardiac monitor
Vital signs q4h × 24 hours then q8h
Diet: no added salt/low saturated fat; low cholesterol
Call house officer for T >101, SBP >190 mm Hg or SBP <90 mm Hg, HR >120 bpm or HR <50 bpm, RR >30 or RR <10
Guaiac ALL stools while on heparin, LMWH, IIb/IIIa inhibitor
O_2: NC continue 2 L/min
Please call house officer for O_2 SAT <90%
Order for respiratory care O_2 SAT check q8h
EKG and repeat for recurrent chest pain
Troponin T/Troponin I: now and every 6 hrs × 8 times
CK-MB: now and every 6 hrs × 8 times
CBC, lipid profile, PTT, Chemistry (7) panel in AM—fasting
Atenolol 75 mg/d
Nitroglycerin 1/150 (0.4 mg) 1 TAB SL q 5 min × 3 prn chest pain; hold if: SBP <100 mm Hg

PRN: Docusate sodium 100 mg po twice daily; aluminum-magnesium hydroxide 15 mL every 6 h for indigestion; oxazepam 15–30 mg po every hs prn insomnia; acetaminophen 650 mg po every 4 h for headache; magnesium hydroxide 30 mL po daily for constipation; magnesium sulfate sliding scale IV qd; call house officer if serum Mg <1.2
Hold order for creatinine >1.9
If serum Mg <1.4, give 5 g $MgSO_4$ IV; if serum Mg <1.6, give 4 g $MgSO_4$ IV; if serum Mg <1.8, give 3 g $MgSO_4$ IV; if serum Mg <2.0, give 2 g $MgSO_4$ IV

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garcia, José, *Male, 61 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 704* **Physician:** *RJ Warren* **Admit Date:** *12/1*

Nutrition Consult: Patient admitted via STEMI protocol. Please facilitate initial and outpatient education.

Social Service: Patient admitted via STEMI protocol. Please assess and assist in need for outpatient support and referral to cardiac rehabilitation.

Nursing Assessment	12/1
Abdominal appearance (concave, flat, rounded, obese, distended)	rounded, obese
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	light brown
Stool consistency	soft
Tubes/ostomies	NA
Genitourinary	
Urinary continence	catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	clear, yellow
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD1=cold, M=moist, H=hot)	DI, M
Skin turgor (good, fair, poor, TENT=tenting)	TENT
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	activity; 22

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garcia, José, *Male, 61 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 704* **Physician:** *RJ Warren* **Admit Date:** *12/1*

Nutrition:

Diet order: no added salt/low saturated fat; low cholesterol
History: Appetite good. He and his wife have been trying to change some things in his diet. Wife indicates that she has been using "corn oil" instead of butter and has tried not to fry foods as often.

Typical dietary intake:

Breakfast:	Coffee with milk and sugar
Midmorning snack:	Egg and cheese on English muffin from work cafeteria; 8 oz. orange juice, 2–3 c coffee with milk and sugar
Lunch:	Leftovers from home; if eats in cafeteria: soup, salad, or sandwich. Had tomato soup and grilled cheese yesterday.
Dinner:	Rice—1 c; black beans—1 c; roast pork with tomato and peppers—approx. 6 oz; cornbread—2 squares, each 2" wide
Snack:	Typically has chips or popcorn and 1–2 beers

Food allergies/intolerances/aversions: None
Previous nutrition therapy? No
Food purchase/preparation: Spouse
Vit/min intake: None

Laboratory Results

	Ref. Range	12/1 1957	12/2 0630	12/3 0645
Chemistry				
Sodium (mEq/L)	136–145	141	142	138
Potassium (mEq/L)	3.5–5.1	4.2	4.1	3.9
Chloride (mEq/L)	98–107	103	102	100
Carbon dioxide (mEq/L)	23–29	23	24	26
BUN (mg/dL)	6–20	14	15	16
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.1	1.1	1.1
BUN/Crea ratio	10.0–20.0	12.7	13.6	13.3
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.1	5.7	6.1
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	68	68	68
Glucose (mg/dL)	70–99	136 !↑	106 !↑	104 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	3.1	3.2	3.0

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garcia, José, *Male, 61 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 704* **Physician:** *RJ Warren* **Admit Date:** *12/1*

Laboratory Results *(Continued)*

	Ref. Range	12/1 1957	12/2 0630	12/3 0645
Magnesium (mg/dL)	1.5–2.4	2.0	2.3	2.0
Calcium (mg/dL)	8.6–10.2	9.4	9.4	9.4
Osmolality (mmol/kg/H_2O)	275–295	292	290	291
Bilirubin total (mg/dL)	≤1.2	0.8	0.76	0.81
Bilirubin, direct (mg/dL)	<0.3	0.10	0.11	0.14
Protein, total (g/dL)	6–7.8	6.0	5.9 !↓	6.1
Albumin (g/dL)	3.5–5.5	4.2	4.3	4.2
Prealbumin (mg/dL)	18–35	30	32	31
Ammonia (µg/L)	6–47	26	22	25
Alkaline phosphatase (U/L)	30–120	75	70	68
ALT (U/L)	4–36	30	215 !↑	185 !↑
AST (U/L)	0–35	25	245 !↑	175 !↑
CPK (U/L)	30–135 F 55–170 M	75	500 !↑	335 !↑
CPK-MB (U/L)	0	0	75 !↑	55 !↑
Lactate dehydrogenase (U/L)	208–378	325	685 !↑	365
Troponin I (ng/dL)	<0.2	2.4 !↑	2.8 !↑	3.1 !↑
Troponin T (ng/dL)	<0.03	2.1 !↑	2.7 !↑	3.2 !↑
Cholesterol (mg/dL)	<200	235 !↑	226 !↑	214 !↑
HDL–C (mg/dL)	>50 F, >40 M	30 !↓	32 !↓	33 !↓
VLDL (mg/dL)	7–32	44 !↑	49 !↑	51 !↑
LDL (mg/dL)	0–99	160 !↑	150 !↑	141 !↑
LDL/HDL ratio	<4.5	5.3 !↑	4.7 !↑	4.3
Apo A (mg/dL)	80–175 F 75–160 M	72 !↓	80	98
Apo B (mg/dL)	45–120 F 50–125 M	115	110	105
Triglycerides (mg/dL)	<150	220 !↑	245 !↑	257 !↑
HbA_{1C} (%)	<5.7	5.5		

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garcia, José, *Male, 61 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 704* **Physician:** *RJ Warren* **Admit Date:** *12/1*

Laboratory Results *(Continued)*

	Ref. Range	12/1 1957	12/2 0630	12/3 0645
Hematology				
WBC ($\times 10^3/mm^3$)	3.9–10.7	11.0 !↑	9.32	8.8
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	4.7	4.75	4.68
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	15	14.8	14.4
Hematocrit (Hct, %)	37–47 F 41–51 M	45	45	44
Mean cell volume (μm^3)	80–96	91	92	90
Mean cell Hgb (pg)	28–32	30	31	30
Mean cell Hgb content (g/dL)	32–36	33	32	33
RBC distribution (%)	11.6–16.5	13.2	12.8	13.0
Platelet count ($\times 10^3/mm^3$)	150–350	320	295	280
Hematology, Manual Diff				
Neutrophil (%)	40–70	55	58	62
Lymphocyte (%)	22–44	22	23	35
Monocyte (%)	0–7	4	4	7
Eosinophil (%)	0–5	0	0	0
Basophil (%)	0–2	0	0	0
Blasts (%)	3–10	3	3	4
Segs (%)	0–60	45	47	52
Bands (%)	0–10	15 !↑	17 !↑	8
Urinalysis				
Collection method	---	catheter	catheter	catheter
Color	---	pale yellow	pale yellow	pale yellow
Appearance	---	clear	clear	clear
Specific gravity	1.001–1.035	1.020	1.015	1.018
pH	5–7	5.8	5.0	6
Protein (mg/dL)	Neg	+ !↑	Neg	Neg
Glucose (mg/dL)	Neg	+ !↑	Neg	Neg

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garcia, José, *Male, 61 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 704* **Physician:** *RJ Warren* **Admit Date:** *12/1*

Laboratory Results *(Continued)*

	Ref. Range	12/1 1957	12/2 0630	12/3 0645
Ketones	Neg	Trace !↑	Neg	Neg
Blood	Neg	Neg	Neg	Neg
Bilirubin	Neg	Neg	Neg	Neg
Nitrites	Neg	Neg	Neg	Neg
Urobilinogen (EU/dL)	1.0	0	0	0
Leukocyte esterase	Neg	Neg	Neg	Neg
Prot chk	Neg	Neg	Neg	Neg
WBCs (/HPF)	0–5	0	0	0
RBCs (/HPF)	0–2	1	0	0
Bact	0	0	0	0
Mucus	0	0	0	0
Crys	0	0	0	0
Casts (/LPF)	0	0	0	0
Yeast	0	0	0	0

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. Mr. Garcia had a myocardial infarction. Explain what happened to his heart muscle and vascular system.

2. Mr. Garcia's chest pain resolved after two sublingual NTG at 3-minute intervals and 2 mg of IV morphine. In the cardiac catherization lab he was "*found to have a totally occluded distal right coronary artery and a 70% occlusion in the left circumflex coronary artery. The left anterior descending was patent. Angioplasty of the distal right coronary artery resulted in a patent infarct-related artery with near-normal flow. A stent was left in place to stabilize the patient and limit infarct size. Left ventricular ejection fraction was normal at 42%, and a posterobasilar scar was present with hypokinesis.*" Explain angioplasty and stent placement. What is the purpose of this medical procedure?

3. Mr. Garcia and his wife are concerned about the future of his heart health. What role does cardiac rehabilitation play in his return to normal activities and in determining his future heart health?

II. Understanding the Nutrition Therapy

4. What are the current recommendations for nutritional intake during a hospitalization following a myocardial infarction?

5. List the risk factors indicated in his medical record that can be addressed through medical nutrition therapy.

6. The RDN plans to talk about the Mediterranean diet with Mr. Garcia and his wife. What are the basic principles of the Mediterranean diet? What does the literature say about the relationship between Mediterranean dietary principles and future heart health?

III. Nutrition Assessment

7. What is the healthy weight range for an individual of Mr. Garcia's height?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

8. Mr. Garcia works in a sedentary job, but he does get some exercise daily. He walks his dog outside for about 15 minutes at a leisurely pace each day and plays with his grandchildren. Calculate his energy and protein requirements.

9. Using Mr. Garcia's 24-hour recall, estimate the total number of kilocalories he consumed as well as the energy distribution of kilocalories for protein, carbohydrate, and fat using the food lists for diabetes.

10. Examine the laboratory results for Mr. Garcia. Which labs are consistent with the MI diagnosis? Explain. Why were the levels higher on 12/2?

11. Mr. Garcia may be at risk for metabolic syndrome. What is this? Does he have any laboratory values that would support this diagnosis?

12. List the abnormal values that are found in his lipid profile. What are the long-term implications? What are the possible treatment options for these abnormalities?

13. Mr. Garcia was prescribed the following medications on discharge. What are the rationale and food–medication interactions for each of these medications?

Lovostatin 20 mg once daily

Clopidogrel 75 mg once daily

Metaprolol 50 mg daily

Lisinopril 10 mg daily

Nitroglycerin 9.0 mg twice daily

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Nitroglycerin 0.4 mg sl prn chest pain

ASA 81 mg daily

14. You talk with Mr. Garcia and his wife. They are friendly and appear interested in your information. They are both anxious to learn what they can do to prevent another heart attack. What are examples of questions that you can ask them to assess how to best help them?

15. Are there other issues besides diet that should be addressed to support successful lifestyle changes for Mr. Garcia? If yes, please list them.

16. From the information gathered within the assessment, list possible nutrition problems using the correct diagnostic terms.

IV. Nutrition Diagnosis

17. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

18. For each of the PES statements you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).

19. Mr. Garcia and his wife ask about supplements. "My roommate here in the hospital told me I should be taking fish oil pills." What does the research say about omega-3 fatty acid supplementation for this patient?

VI. Nutrition Monitoring and Evaluation

20. What would you want to assess in three to four weeks when Mr. Garcia and his wife return for additional counseling? (*Hint:* Your follow-up assessment should be based on signs and symptoms in your PES statements.)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

2018 Physical Activity Guidelines Advisory Committee. 2018 Physical Activity Guidelines Advisory Committee Scientific Report. Washington, DC: U.S. Department of Health and Human Services, 2018.

2017 ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Eur Heart J*. 2018;39:119–177.

2013 ACCF/AHA guideline for the management of patients with ST-elevation myocardial infarction. *Circulation*. 2013;61:e78–e140.

Asprey KE, Kris-Etherton PM. Diet change to reduce residual risk after myocardial infarction. American College of Cardiology. 2016. https://www.acc.org/education-and-meetings/patient-case-quizzes/diet-change-to-reduce-residual-risk-after-myocardial-infarction. Accessed January 22, 2020.

Balk EM, Lichtenstein AH. Omega-3 fatty acids and cardiovascular disease: Summary of the 2016 Agency of Healthcare Research and Quality Evidence Review. *Nutrients.* 2017;9:E865.

Benjamin EJ, Muntner P, Alonso A, et al. Heart disease and stroke statistics—2019 update: A report from the American Heart Association. *Circulation.* 2019;139:e57–e526. https://www.ahajournals.org/doi/10.1161/CIR.0000000000000659. Accessed January 22, 2020.

Benjamin EJ, Virani SS, Callaway CW, et al. Heart disease and stroke statistics, 2018 update: A report from the American Heart Association. *Circulation.* 2018;137:e67–e492.

Dinu M, Pagliai G, Casini A, Sofi F. Mediterranean diet and multiple health outcomes: An umbrella review of meta-analyses of observational studies and randomized trials. *Eur J Clin Nutr.* 2018;72:30–43.

Ekblom O, Ek A, Cider A, Hambraeus K, Börjesson M. Increased physical activity post–myocardial infarction is related to reduced mortality: Results from the SWEDEHEART registry. *J Am Heart Assoc.* 2018;7(24):e010108.

Grundy SM, Stone NJ, Bailey AL, et al. 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA guideline on the management of blood cholesterol. *J Am Coll Cardiol.* 2018;73(24).

Healthy eating after a heart attack. heartfoundation.org. https://www.heartfoundation.org.au/after-my-heart-attack/heart-attack-recovery/meals-and-food. Accessed January 22, 2020.

Jellinger PS, Handelsman Y, Rosenblit PD, et al. AACE guidelines for the management of dyslipidemia and prevention of cardiovascular disease. *Endoc Pract.* 2017;23:1–87.

Makarewicz-Wujec M, Parol G, Parzonko A, Kozlowsk-Wojciechowska M. Supplementation with omega-3 acids after myocardial infarction and modification of inflammatory markers in light of the patients' diet: A preliminary study. *Kardiol Pol.* 2017;75:674–681.

Nahikian-Nelms ML. Nutrition assessment: Foundation of the nutrition care process. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:38–75

Preston Mason R. New insights into mechanisms of action for omega-3 fatty acids in atherothrombotic cardiovascular disease. *Cirr Atheroscler Rep.* 2019;21:2.

Pronsky ZM, Crowe JP. *Food and Medication Interaction*. 19th ed. Birchrunville, PA: Food Medication Interactions; 2018.

Stone NJ, Robinson J, Lichtenstein AH, et al. 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: A report of the American College of Cardiology/American Heart Association. *Circulation.* 2014;129(25):S1–S45.

Sucher K, Nahikian-Nelms MN. Diseases of the cardiovascular system. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:296–341.

Tektonidis TG, Akesson AM, Gigante B, Wolk A, Larsson SC. A Mediterranean diet and risk of myocardial infarction, heart failure, and stroke: A population-based cohort study. *Atherosclerosis.* 2015;243:93–98.

U.S. National Library of Medicine. MedlinePlus. Fish oil. https://pdfs.semanticscholar.org/7c8f/47b683dfa143e2607160ce688d1b17176b18.pdf. Accessed January 22, 2020.

Internet Resources

AND Evidence Analysis Library: https://www.andeal.org/

The Cleveland Clinic: Acute Myocardial Infarction: http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/cardiology/acute-myocardial-infarction/

Drug Bank: http://www.drugbank.ca/

Nutrition Care Manual: http://www.nutritioncaremanual.org

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 6

Heart Failure

Tommy Fletch, a 55-year-old male, is admitted with acute symptoms related to his heart failure. Mr. Fletch was diagnosed with idiopathic cardiomyopathy 5 years ago, resulting in congestive heart failure and requiring multiple hospitalizations.

Objectives

After completing this case, the student will be able to:

1. Explain the basic pathophysiology of heart failure and the subsequent effects on pulmonary, renal, and liver function.
2. Correlate a patient's signs and symptoms with the pathophysiology of heart failure.
3. Demonstrate understanding of heart failure's potential effects on an individual's nutritional status.
4. Identify the roles of pharmacologic intervention in the treatment of heart failure and common drug–nutrient interactions.
5. Use nutrition assessment information to determine baseline nutritional status and identify factors that may suggest malnutrition.
6. Determine appropriate nutritional interventions for the patient with heart failure.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fletch, Tommy, *Male, 55 y.o.*
Allergies: *Egg* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 1952* **Physician:** *A McMann, MD* **Admit Date:** *2/14*

Josep Curto/Shutterstock.com

Patient Summary: Tommy Fletch has a past medical history of idiopathic cardiomyopathy, rheumatoid arthritis, and osteoporosis.

History:

Onset of disease: HF × 5 yrs
Medical history: Idiopathic cardiomyopathy, rheumatoid arthritis, osteoporosis
Surgical history: None
Medications at home: Lisinopril 10 mg once daily, furosemide 40 mg twice daily, atorvastatin 40 mg daily, carvedilol 12.5 mg po twice daily, calcium carbonate 500 mg twice daily, multivitamin 1 tablet daily, ondansetron 4 mg prn, alendronate 70 mg weekly
Tobacco use: No
Alcohol use: Remote history of alcoholism (>8 years ago)
Family history: What? Lung cancer. Who? Paternal grandmother.

Demographics:

Marital status: Married—lives with wife; *Spouse name:* Allison
Number of children: 2
Years education: Associate's degree
Language: English only
Occupation: Truck driver
Hours of work: N/A
Ethnicity: Caucasian
Religious affiliation: None

Admitting History/Physical:

Chief complaint: Dyspnea on exertion that has worsened over the past 3 days.
General appearance: 55 y.o. male—tall, thin, and in acute distress

Vital Signs:

Temp: 98.5°F	Pulse: 81	Resp rate: 22
BP: 156/105	Height: 6'4"	Weight: 185 lbs

HEENT: Head: temporal wasting
Eyes: excessive tearing
Ears: WNL
Nose: WNL
Throat: jugular venous distension in sitting position with a positive hepatojugular reflux
Cardiac: Dyspnea on exertion; cardiomegaly; global left ventricle hypokinesis with EF 25%; moderately reduced right ventricular systolic function
Pulmonary/Chest: Pulmonary venous congestion
Abdominal: Ascites, no masses, liver tender to A&P

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fletch, Tommy, *Male, 55 y.o.*
Allergies: *Egg* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 1952* **Physician:** *A McMann, MD* **Admit Date:** *2/14*

Extremities: 4+ lower extremity edema; weak hand grip; joint pain and swelling
Neurological: Mild confusion, gait ataxia
Skin: moist

Nursing Assessment	**2/14**
Abdominal appearance (concave, flat, rounded, obese, distended)	distended
Palpation of abdomen (soft, rigid, firm, masses, tense)	firm
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	hypo
LLQ	P
Stool color	dark brown
Stool consistency	hard
Tubes/ostomies	NA
Genitourinary	
Urinary continence	catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	clear, yellow
Integumentary	
Skin color	wnl
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD1=cold, M=moist, H=hot)	M
Skin turgor (good, fair, poor, TENT=tenting)	good
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	activity, 15

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fletch, Tommy, *Male, 55 y.o.*
Allergies: *Egg* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 1952* **Physician:** *A McMann, MD* **Admit Date:** *2/14*

Orders:

Admit to CCU
Parenteral dopamine and IV furosemide
100 mg thiamin IV
Telemetry
Vitals every 1 hr × 8, every 2 hrs × 8 for first 24 hours
Daily ECG and chest X-rays
Echocardiogram
Chem 24, serum thiamin level
Urinalysis
Strict I&Os

Nutrition:

Meal type: 2 g Na, 1.5 L fluid restriction
Intake % of meals: <25%, sips of liquids for past 24 hrs
Fluid requirement: 2000 mL
History: Wife reports that Mr. Fletch's appetite has progressively declined over the last 3 months, which she relates to his chronic fatigue, lack of appetite, and persistent nausea. She is unsure of his weight loss, but reports that his face and upper body appear thinner. She thinks the swelling around his legs and ankles has gotten worse the past few days "so I am sure the scales are off."
Usual dietary intake: Skips breakfast because nausea is typically worse in the morning. Sandwiches for lunch and meat/potatoes for dinner.
Food allergies/intolerances/aversions: Egg
Previous nutrition therapy? Yes, low-sodium diet education 5 years ago
Food purchase/preparation: Spouse. Dines out 2–3 meals per week.
Vit/min intake: Centrum Complete 1 tablet daily, calcium supplement 1000 mg/day

Laboratory Results

	Ref. Range	2/14 1952	2/16 0645
Chemistry			
Sodium (mEq/L)	136–145	128 !↓	131 !↓
Potassium (mEq/L)	3.5–5.1	3.6	3.9
Chloride (mEq/L)	98–107	98	101
Carbon dioxide (mEq/L)	23–29	28	26
BUN (mg/dL)	6–20	28 !↑	27 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.4 !↑	1.5 !↑
BUN/Crea ratio	10.0–20.0	20	18

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fletch, Tommy, *Male, 55 y.o.*
Allergies: *Egg* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 1952* **Physician:** *A McMann, MD* **Admit Date:** *2/14*

Laboratory Results *(Continued)*

	Ref. Range	2/14 1952	2/16 0645
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	4.1	4.5
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	43 !↓	44 !↓
Glucose (mg/dL)	70–99	105 !↑	106 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	2.5	2.2
Magnesium (mg/dL)	1.5–2.4	2.2	1.9
Calcium (mg/dL)	8.6–10.2	8.0 !↓	8.4 !↓
Osmolality (mmol/kg/H_2O)	275–295	281	284
Bilirubin total (mg/dL)	≤1.2	1.3 !↑	1.2
Bilirubin, direct (mg/dL)	<0.3	0.4 !↑	0.2
Protein, total (g/dL)	6–7.8	5.5 !↓	5.6 !↓
Albumin (g/dL)	3.5–5.5	2.6 !↓	2.7 !↓
Prealbumin (mg/dL)	18–35	12 !↓	14 !↓
Ammonia (µg/L)	6–47	40	41
Alkaline phosphatase (U/L)	30–120	167 !↑	171 !↑
ALT (U/L)	4–36	70 !↑	76 !↑
AST (U/L)	0–35	55 !↑	61 !↑
CPK (U/L)	30–135 F 55–170 M	160	155
Lactate dehydrogenase (U/L)	208–378	350	346
Troponin I (ng/L)	<0.03	0.02	0.01
Troponin T (ng/L)	<10 ng/L F <15 ng/L M	12	13
BNP (pg/mL)	<100	878 !↑	871 !↑
CRP (mg/L)	<1.0	157 !↑	141 !↑
Cholesterol (mg/dL)	<200	149	146
HDL-C (mg/dL)	>50 F, >40 M	41	43
VLDL (mg/dL)	7–32	17	19
LDL (mg/dL)	0–99	124 ↑	127 ↑

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fletch, Tommy, *Male, 55 y.o.*
Allergies: *Egg* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 1952* **Physician:** *A McMann, MD* **Admit Date:** *2/14*

Laboratory Results *(Continued)*

	Ref. Range	2/14 1952	2/16 0645
LDL/HDL ratio	<4.5	3.02	2.95
Triglycerides (mg/dL)	<150	101	89
HbA_{1C} (%)	<5.7	4.8	
Coagulation (Coag)			
INR	0.9–1.1	0.99	
Hematology			
WBC ($\times 10^3/mm^3$)	3.9–10.7	11.1 !↑	11.0 !↑
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	3.9 !↓	4.0 !↓
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	10.0 !↓	10.7 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	30.1 !↓	31 !↓
Platelet count ($\times 10^3/mm^3$)	150–350	245	254
Thiamin, whole blood	70–180 nmol/L	55 !↓	
Arterial Blood Gases (ABGs)			
pH	7.35–7.45	7.45	7.43
pCO_2 (mm Hg)	35–45	33 !↓	34 !↓
SO_2 (%)	≥95	90 !↓	96
CO_2 content (mmol/L)	25–30	37 !↑	33 !↑
O_2 content (%)	15–22	14 !↓	18
pO_2 (mm Hg)	≥80	84	82
HCO_3^- (mEq/L)	21–28	24	20 !↓

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fletch, Tommy, *Male, 55 y.o.*
Allergies: *Egg* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 1952* **Physician:** *A McMann, MD* **Admit Date:** *2/14*

Intake/Output

Date		**2/14 0701–2/15 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**0**	**0**	**0**	**0**
	I.V.	**500**	**500**	**500**	**1500**
	(mL/kg/hr)	(0.83)	(0.83)	(0.83)	(0.83)
	I.V. piggyback				
	PN				
	Total intake	**500**	**500**	**500**	**1500**
	(mL/kg)	(6.7)	(6.7)	(6.7)	(20)
OUT	Urine	**300**	**355**	**250**	**905**
	(mL/kg/hr)	(0.50)	(0.59)	(0.41)	(0.50)
	Emesis output				
	Other				
	Stool				
	Total output	**300**	**355**	**250**	**905**
	(mL/kg)	(4.0)	(4.7)	(3.3)	(12.1)
Net I/O		**+200**	**+145**	**+250**	**+595**
Net since admission (2/14)		**+200**	**+145**	**+250**	**+595**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. Outline the typical pathophysiology of heart failure. Compare and contrast R-sided failure and L-sided failure.

2. What is idiopathic cardiomyopathy? Describe how cardiomyopathy can progress to heart failure.

3. Identify specific signs and symptoms in the patient's physical examination that are consistent with heart failure. For any three of these signs and symptoms, write a brief discussion that connects them to physiological changes that you described in question #1.

II. Understanding the Nutrition Therapy

4. Mr. Fletch's wife states that they have monitored their salt intake for several years. What is the role of sodium restriction in the treatment of heart failure? What level of sodium restriction is recommended for the outpatient with heart failure? What difficulties may a patient have in following a sodium restriction?

5. Why is Mr. Fletch on a fluid restriction? How will this assist with the treatment of his heart failure? What specific foods are typically "counted" as a fluid?

6. What is the role of thiamin infusion in the cardiac intensive care unit? Why was a serum thiamin level included in Dr. McMann's orders?

III. Nutrition Assessment

7. Identify factors that would affect the interpretation of Mr. Fletch's weight and body composition. Look at the I/O record. What will likely happen to Mr. Fletch's weight if this trend continues?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

8. Calculate Mr. Fletch's energy and protein requirements. Explain your rationale for the weight you have used in your calculation.

9. Malnutrition in heart failure is often referred to as cardiac cachexia. What is cardiac cachexia? Using the information provided in the case, can you support a diagnosis of malnutrition using the latest AND/ASPEN proposed guidelines for malnutrition diagnosis?

10. Do you feel that Mr. Fletch may benefit from enteral feeding? What guidelines would you use to make this decision? Outline a nutrition therapy regimen for him that includes formula choice, total volume, and goal rate.

11. Identify and assess any abnormal biochemical values associated with Mr. Fletch's heart failure.

Name of Laboratory Value	Normal Value	Pt's Value & Date	Reason for Abnormality

12. The following drugs/supplements were prescribed for Mr. Fletch. Give the medical rationale for the use of each. In addition, describe any nutritional concerns for Mr. Fletch while he is taking these medications.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Lisinopril:
Furosemide:
Carvedilol:
Thiamin:

IV. Nutrition Diagnosis

13. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

14. Mr. Fletch was not able to tolerate the enteral feeding because of persistent nausea and vomiting. What recommendations could be made to improve tolerance to the enteral feeding?

15. The feeding tube was accidentally removed while discontinuing the mechanical ventilator. The team decides to retry oral diet prior to making a decision to replace the feeding tube. What recommendations could you make to optimize Mr. Fletch's oral intake?

16. Outline steps you would take to assist Mr. Fletch as he prepares for discharge. Include the specific nutrition education that you would include and the continued need for any micronutrient supplementation.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics. Evidence Analysis Library. Heart Failure Guideline (2017). http://andevidencelibrary.com/topic.cfm?menu=5227. Accessed February 10, 2020.

Academy of Nutrition and Dietetics. Nutrition Care Manual: Heart Failure. https://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=1&lv1=5803&lv2=8585&ncm_toc_id=8585&ncm_heading=Nutrition%20Care. Accessed January 22, 2020.

Benjamin EJ, Virani SS, Callaway CW, et al. Heart disease and stroke statistics, 2018 update: A report from the American Heart Association. *Circulation*. 2018;137:e67–e492.

Frank LL. Thiamine in clinical practice. *J Parenter Enteral Nutr*. 2015; 39:503–20.

Georgiopoulos G, Chrysohoou C, Vogiatzi G, et al. Vitamins in heart failure: Friend or enemy? *Curr Pharm Des*. 2017;23(25):3731–3742.

Grundy SM, Stone NJ, Bailey AL, et al. 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/ AGS/APhA/ASPC/NLA/PCNA guideline on the management of blood cholesterol: A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2019;139:e1082–e1143.

Hummel SL, Karmally W, Gillespie BW, et al. Home-delivered meals post-discharge from heart failure hospitalization: The GOURMET-HF pilot study. *Circulation*. 2018;11:e004886.

Joyce E. Frailty in advanced heart failure. *Heart Fail Clin*. 2016;12:363–374.

Mann DL, Chakinala M. Heart failure: Pathophysiology and diagnosis. In Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J., eds. *Harrison's Pricipals of Internal Medicine*. 20th ed. New York, NY: McGraw-Hill; 2018. http://accessmedicine.mhmedical.com/content.aspx?bookid=2129&sectionid=192028958. Accessed February 10, 2020.

McClave SA, Taylor BE, Martindale RG, et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). *J Parenter Enteral Nutr*. 2016;40:159–211.

Rahman A, Jeejeebhoy K, Nagpal AD, et al. Malnutrition and cachexia in heart failure. *J Parent Enteral Nutr*. 2016;40:475–486.

Schultheiss HP, Fairweather D, Caforio ALP, et al. Dilated cardiomyopathy. *Nat Rev Dis Primers*. 2019;5(1):32.

Sciatti E, Lombardi C, Ravera A, et al. Nutritional deficiency in patients with heart failure. *Nutrients*. 2016;8:402–418.

Sucher K, Nahikian-Nelms MN. Diseases of the cardiovascular system. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:296–341.

Ukleja A, Gilbert K, Mogensen KM, et al. Standards for nutrition support: Adult hospitalized patients. *Nutr Clin Pract*. 2018;33:906–920.

Ziaeian B, Fonarow GC. The prevention of hospital readmissions in heart failure. *Prog Cardiovasc Dis*. 2016;58:379–385.

Yancy CW, Jessup M, Bozkurt B, et al. 2017 ACC/AHA/HFSA focused update of the 2013 ACCF/AHA guideline for the management of heart failure: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Failure Society of America. *Circulation*. 2017;136:e137–161.

Internet Resources

Academy of Nutrition and Dietetics: Nutrition Care Manual (by subscription): www.nutritioncaremanual.org

American Heart Association: http://www.heart.org/HEARTORG/Conditions/HeartFailure/Heart-Failure_UCM_002019_SubHomePage.jsp

Heart Failure (animation): http://medmovie.com/library_id/3255/topic/ahaw_0079a/

Heart Failure Society of America: http://www.hfsa.org/

Heart Failure Online: www.heartfailure.org

MedlinePlus: Heart Failure Overview: www.nlm.nih.gov/medlineplus/ency/article/000158.htm

WebMD: Cardiac Cachexia: http://www.webmd.com/heart-disease/heart-failure/tc/cardiac-cachexia-topic-overview

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Three

NUTRITION THERAPY FOR UPPER GASTROINTESTINAL DISORDERS

The seven cases presented in Units Three and Four cover a wide array of diagnoses that ultimately affect normal digestion and absorption. These conditions use medical nutrition therapy as a cornerstone of their treatment.

In some disorders, such as celiac disease, medical nutrition therapy is the *only* treatment. With other GI problems, it is important to understand that, because of the symptoms the patient experiences, nutritional status is often in jeopardy. Nausea, vomiting, diarrhea, constipation, and malabsorption are common with these disorders. Interventions in these cases are focused on treating such symptoms in order to restore nutritional health.

Case 7 targets gastroesophageal reflux disease (GERD). More than 20 million Americans suffer from symptoms of gastroesophageal reflux daily, and more than 100 million suffer occasional symptoms. Gastroesophageal reflux disease most frequently results from lower esophageal sphincter (LES) incompetence. Factors that influence LES competence include both physical and lifestyle factors. This case identifies the common symptoms of GERD and challenges you to develop and analyze both nutritional and medical care for this patient.

Case 8 addresses the condition of gastroparesis, which is defined as delayed gastric emptying. Individuals with gastroparesis are at high risk of malnutrition, due to the inability to consume adequate nutrients, and/or frequent vomiting, with subsequent dehydration and electrolyte imbalances. Classic presentation of gastroparesis and the necessary medical nutrition therapy to treat symptoms is presented in this case. This case can be used to discuss the diagnostic tests required for gastroparesis and the approved pharmacotherapy and surgical approaches to treatment. Discussion of appropriate dietary substitutions to alleviate nausea and vomiting is highlighted in the report of usual dietary intake.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 7

Gastroesophageal Reflux Disease

Krishna Gupta, a 48-year-old male, visited his physician for evaluation of increasing complaints of severe indigestion. He was scheduled for a variety of tests—including intraesophageal pH monitoring and a barium esophagram—that support a diagnosis of gastroesophageal reflux disease.

Objectives

After completing this case, the student will be able to:

1. Apply knowledge of the pathophysiology of gastroesophageal reflux disease (GERD) in order to identify and explain common nutritional problems associated with this disease.
2. Describe basic principles of drug action required for medical treatment of GERD.
3. Understand the potential complications of untreated GERD.
4. Discuss the rationale for nutrition recommendations to minimize adverse symptoms of GERD.
5. Interpret pertinent laboratory parameters for nutritional implications and significance.
6. Analyze nutrition assessment data to evaluate nutritional status and identify specific nutrition problems.
7. Determine nutrition diagnoses and write appropriate PES statements.
8. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Gupta, Krishna, *Male, 48 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *Jen Li* **Date:** *11/1*

Ranta Images/Shutterstock.com

Patient Summary: 48-y.o. male here for evaluation and treatment for increased and recurrent symptoms of indigestion.

History:

Onset of disease: Patient has been experiencing increased indigestion over last year. Previously it was only at night but now he experiences indigestion almost constantly. He has been taking Tums several times daily and has tried the herb fenugreek and turmeric for relief of symptoms. Mr. Gupta has gained almost 30 lbs since he had knee surgery 3 years ago, which he attributes to a decrease in his ability to run and not being able to find a consistent replacement for this form of exercise. Patient states he plays with his children on the weekends, but that is the extent of his physical activity. He states he probably has been eating and drinking more over the last year, which he attributes to stress. He is worried about his family history of heart disease, which is why he takes an aspirin each day. He has not changed his diet in any way except for the addition of fenugreek and turmeric.
Medical history: Essential HTN—Dx 1 year ago
Surgical history: s/p R knee arthroplasty 5 years ago
Medications at home: Metoprolol 50 mg daily; 325 mg aspirin daily; multivitamin daily; 500 mg ibuprofen twice daily for last month
Tobacco use: No
Alcohol use: Yes; 1–2 beers 1–2 times/week
Family history: What? CAD. Who? Father.

Demographics:

Marital status: Married—lives with wife and 2 sons
Spouse name: Saanvi
Number of children: 2 (ages 8 and 12)
Years education: BA
Language: English and Hindi
Occupation: Retail manager of local department store
Hours of work: M–F, works consistently in evenings and on weekends as well
Ethnicity: Indian
Religious affiliation: Hinduism

MD Progress Note:

General/Constitutional: Well-developed, overweight 48-year-old Indian male in mild distress.
HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: oral mucosa pink, dentition in good repair
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Gupta, Krishna, *Male, 48 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *Jen Li* **Date:** *11/1*

Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants. Liver percusses approx 8 cm at the midclavicular line, one fingerbreadth below the right costal margin. Epigastric tenderness without rebound or guarding.
Extremities: Normal range of motion in all four extremities. No cyanosis or clubbing or peripheral edema.
Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Skin is warm and dry. No rashes or ulcerations noted.

Vital Signs:

Temp: 98.6°F	Pulse: 90	Resp rate: 16
BP: 119/75	Height: 5'9"	Weight: 215 lbs

Assessment and Plan:

Dx: Gastroesophageal reflux disease, HTN

Medical Tx plan: Hematology, Chem 24, Ambulatory 48-hour pH monitoring with Bravo™ pH monitoring system, Barium esophagram—request radiologist to attempt to demonstrate reflux using abdominal pressure and positional changes; Endoscopy with biopsy to r/o *H. pylori* infection; Begin omeprazole 30 mg every am; Decrease aspirin to 75 mg daily; D/C self-medication of ibuprofen daily; Nutrition consult.

..... J. Li, MD

Nutrition:
History: Patient relates he has gained almost 30 lbs since his knee surgery. He attributes this to a decrease in his ability to run, and he has not found a consistent replacement for this form of exercise. He plays with his children on weekends, but that is the extent of his physical activity. He states he probably has been eating and drinking more over the last year, which he attributes to stress with his busy lifestyle and long work hours. He is worried about his family history of heart disease, which is why he takes an aspirin each day. He has not really followed any diet restrictions for health concerns. He eats a combination of traditional Indian foods along with more American-style food choices. He has lived in the United States since his high school years, so he does not follow any strict dietary practices related to his religious background of Hinduism.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Gupta, Krishna, *Male, 48 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *Jen Li* **Date:** *11/1*

Usual dietary intake:

AM:	1½ c hot cereal; 2¾ c skim milk on cereal; sometimes egg and naan 16 oz orange juice Hot tea with milk and sugar
Lunch:	Fast food chicken sandwich with fries, Diet Coke—or leftovers from previous evening
Snack when he comes home:	Handful of crackers, cookies, or chips, 1 12-oz beer
PM:	Typically eats traditional Indian foods at home for evening meal: 3–4 oz of meat (chicken primarily) or tofu (grilled or cooked on top of stove) cooked with rice and vegetables; chapattis; hot chai or black tea. Relates that his family's schedule has been increasingly busy, so they sometimes (1–2 times per week) order pizza or stop for fast food instead of cooking.
Late PM:	Ice cream, popcorn, or crackers. Drinks 3–4 12-oz diet sodas daily as well as hot tea.

24-hr recall:

(At home PTA):	2 scrambled eggs, naan; hot black tea
At work:	3 12-oz Diet Pepsis
Lunch:	Leftover curry with spinach, chickpeas, rice—2 c Hot black tea
Late afternoon:	2 c chips, 1 beer
Dinner:	Lentil dal—2 c. over approx. 2 c rice 2 slices naan 2 c hot chai tea
Bedtime:	2 c ice cream

Food allergies/intolerances/aversions: Fried foods seem to make the indigestion worse
Previous nutrition therapy? No
Food purchase/preparation: Wife or eats out
Vit/min intake: One-A-Day for Men multivitamin daily

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Gupta, Krishna, *Male, 48 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *Jen Li* **Date:** *11/1*

Laboratory Results

	Ref. Range	11/1 0700
Chemistry		
Sodium (mEq/L)	136–145	144
Potassium (mEq/L)	3.5–5.1	4.5
Chloride (mEq/L)	98–107	102
Carbon dioxide (mEq/L)	23–29	25
BUN (mg/dL)	6–20	8
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	0.9
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.1
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	117
Glucose (mg/dL)	70–99	91
Phosphate, inorganic (mg/dL)	2.2–4.6	3.8
Magnesium (mg/dL)	1.5–2.4	1.9
Calcium (mg/dL)	8.6–10.2	8.9
Bilirubin total (mg/dL)	≤1.2	0.9
Bilirubin, direct (mg/dL)	<0.3	0.05
Protein, total (g/dL)	6–7.8	6.3
Albumin (g/dL)	3.5–5.5	4.5
Prealbumin (mg/dL)	18–35	31
Alkaline phosphatase (U/L)	30–120	83
ALT (U/L)	4–36	11
AST (U/L)	0–35	9
CPK (U/L)	30–135 F 55–170 M	71
Lactate dehydrogenase (U/L)	208–378	210
Cholesterol (mg/dL)	<200	245 !↑
HDL-C (mg/dL)	>50 F, >40 M	52
VLDL (mg/dL)	7–32	35 !↑
LDL (mg/dL)	0–99	157 !↑

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Gupta, Krishna, *Male, 48 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *Jen Li* **Date:** *11/1*

Laboratory Results *(Continued)*

	Ref. Range	11/1 0700
LDL/HDL ratio	<4.5	3.02
Triglycerides (mg/dL)	<150	178 !↑
HbA_{1C} (%)	<5.7	5.1
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	5.6
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	5.2
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	14.0
Hematocrit (Hct, %)	37–47 F 41–51 M	43
Mean cell volume (μm^3)	80–96	85
Mean cell Hgb (pg)	28–32	28
Mean cell Hgb content (g/dL)	32–36	32
RBC distribution (%)	11.6–16.5	15.5
Platelet count ($\times 10^3/mm^3$)	150–350	345
Hematology, Manual Diff		
Neutrophil (%)	40–70	55
Lymphocyte (%)	22–44	28
Monocyte (%)	0–7	6
Eosinophil (%)	0–5	0
Basophil (%)	0–2	0
Blasts (%)	3–10	3
Urinalysis		
Collection method	—	Clean catch
Color	—	Pale yellow
Appearance	—	Clear
Specific gravity	1.001–1.035	1.006
pH	5–7	6.1
Protein (mg/dL)	Neg	Neg
Glucose (mg/dL)	Neg	Neg

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Gupta, Krishna, *Male, 48 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *Jen Li* **Date:** *11/1*

Laboratory Results *(Continued)*

	Ref. Range	11/1 0700
Ketones	Neg	Neg
Blood	Neg	Neg
Bilirubin	Neg	Neg
Nitrites	Neg	Neg
Urobilinogen (EU/dL)	<1.0	0.009
Leukocyte esterase	Neg	Neg
Prot chk	Neg	Neg
WBCs (/HPF)	0–5	1
RBCs (/HPF)	0–2	0.5
Bact	0	0
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. How and where is acid produced in the stomach and how is acid production controlled within the gastrointestinal tract?

2. What role does lower esophageal sphincter (LES) pressure play in the etiology of gastroesophageal reflux disease? What factors affect LES pressure?

3. What are the complications of gastroesophageal reflux disease?

4. The physician biopsied for *H. pylori*. What is this?

5. Identify the patient's signs and symptoms that could suggest the diagnosis of gastroesophageal reflux disease.

6. Describe the diagnostic tests performed for this patient.

7. What risk factors does the patient present with that might contribute to his diagnosis? (Be sure to consider lifestyle, medical, and nutritional factors.)

8. The MD has decreased the patient's dose of daily aspirin and recommended discontinuing his ibuprofen. Why? How might aspirin and other NSAIDs affect gastroesophageal disease?

9. The MD has prescribed omeprazole. What class of medication is this? What is the basic mechanism of the drug? What other drugs are available in this class? What other groups of medications are used to treat GERD?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

II. Understanding the Nutrition Therapy

10. Summarize the current recommendations for nutrition therapy for GERD.

III. Nutrition Assessment

11. Calculate the patient's %UBW and BMI. What does this assessment of weight tell you? In what ways may this contribute to his diagnosis?

12. Calculate energy and protein requirements for Mr. Gupta. How would this recommendation be modified to support a gradual weight loss?

13. Mr. Gupta and his wife are originally from India. Are there components of their traditional diet that may aggravate his symptoms of GERD?

14. What considerations related to Hinduism should you keep in mind when assessing Mr. Gupta's diet?

15. Estimate his caloric intake from his 24-hour recall. How does this compare to your calculated energy requirements?

16. Are there any abnormal labs that should be addressed to improve Mr. Gupta's overall health? Explain.

17. Mr. Gupta's history includes the use of fenugreek and turmeric as alternative treatments for his symptoms of GERD. Examine the evidence regarding these supplements. What could you tell Mr. Gupta? Are there any concerns with the ingestion of these supplements?

18. What other components of lifestyle modification would you address to help treat his diagnosis?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

IV. Nutrition Diagnosis

19. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

20. Determine the appropriate intervention for each nutrition diagnosis.

21. Does the long-term use of proton pump inhibitors have nutritional or other health consequences? Are there specific interventions that you might implement to address these effects?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Nutrition Care Manual. https://www.nutritioncaremanual.org/client_ed.cfm?ncm_client_ed_id=165. Accessed January 22, 2020.

Corsonello A, Lattanzio F, Bustacchini S, et al. Adverse events of proton pump inhibitors: Potential mechanisms. *Curr Drug Metab.* 2018;19:142–154.

Esmaillzadeh A, Keshteli AH, Feizi A, Zaribaf F, Feinle-Bisset C, Adibi P. Patterns of diet-related practices and prevalence of gastro-esophageal reflux disease. *Neurogastro Motil*. 2013;25:831–e638.

Freedberg DE, Kim LS, Yang YX. The risks and benefits of long-term use of proton-pump inhibitors: Expert review and best practice advice from the American Gastroenterological Association. *Gastroenterology.* 2017;152:796–715.

Katz PO, Gerson LB, Vila MF. Diagnosis and management of gastroesophageal disease. *Am J Gastroenterol*. 2013;108:308–328.

Kittler P, Sucher K, Nelms M. Food and religion. In Kittler P, Sucher K, Nelms M. *Food and Culture* 6th ed. Belmont, CA: Cengage Learning; 2011:94–97.

Kahrilas PJ, Hirano I. Diseases of the esophagus. In Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J., eds. *Harrison's Principals of Internal Medicine.* 20th ed. New York, NY: McGraw-Hill; 2018. http://accessmedicine.mhmedical.com/content.aspx?bookid=2129&sectionid=192282054. Accessed February 11, 2020.

Moayyedi PM, Lacy BE, Andrews CN, Enns RA, Howden CW, Vakil N. ACG and CAG clinical guideline: Management of dyspepsia. *Am J Gastroenterol*. 2017;112:988–1038.

National Institute of Diabetes and Digestive and Kidney Diseases. Eating, Diet, & Nutrition for GER & GERD. https://www.niddk.nih.gov/health-information/digestive-diseases/acid-reflux-ger-gerd-adults/eating-diet-nutrition. Accessed February 11, 2020.

Nahikian-Nelms ML. Nutrition assessment: Foundation of the nutrition care process. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:38–75.

Nelms MN. Diseases of the upper gastrointestinal tract. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:342–378.

Patrick L. Gastroesophageal reflux disease (GERD): A review of conventional and alternative treatments. *Altern Med Rev*. 2011;16(2):116–133.

Pronsky ZM, Crowe JP. *Food and Medication Interaction,* 19th ed. Birchrunville, PA: Food-Medication Interactions; 2018.

Health care providers' handbook on Hindu patients. Queensland Government. https://www.health.qld.gov.au/multicultural/health_workers/hbook-hindu. Updated October 1, 2013. Accessed January 22, 2020.

Richter JE, Rubenstein JH. Presentation and epidemiology of gastroesophageal reflux disease. *Gastroenterology.* 2018;154:267–276.

Sethi S, Richter JE. Diet and gastoesophageal reflux disease: Role in pathogenesis and management. *Curr Opin Gastroenterol.* 2017;33:107–111

Singh M, Lee J, Gupta N, et al. Weight loss can lead to resolution of gastroesophageal reflux disease of symptoms: A prospective intervention trial. *Obesity*. 2013;21:284–290.

Sung Kim J, Byung-Wook K. Are diet and micronutrients effective in treating gastroesophageal reflux disease especially in women? *J Neurogastroenterol.* 2019;25:1–2.

Internet Resources

American College of Gastroenterology: Acid Reflux: http://patients.gi.org/topics/acid-reflux/

Antunes C, Curtis SA. Gastroesophageal Reflux Disease: https://www.ncbi.nlm.nih.gov/books/NBK441938/

National Center for Complementary and Integrative Health: https://nccih.nih.gov/

National Institute of Diabetes and Digestive and Kidney Diseases: Digestive Diseases A–Z: http://digestive.niddk.nih.gov

Medline Plus GERD. http://www.nlm.nih.gov/medlineplus/gerd.html

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 8

Gastroparesis

Dorothy Williams is here for a follow-up appointment with her gastroenterologist and the clinic's RDN. She has recently been diagnosed with gastroparesis and needs assistance with nutrition therapy for this condition.

Objectives

After completing this case, the student will be able to:

1. Apply knowledge of the pathophysiology of gastroparesis in order to identify and explain common nutritional problems associated with this condition.
2. Identify the signs and symptoms associated with gastroparesis.
3. Discuss the rationale for nutrition recommendations to minimize adverse symptoms of gastroparesis and to improve nutritional outcomes.
4. Interpret pertinent laboratory parameters for nutritional implications and significance.
5. Analyze nutrition assessment data to evaluate nutritional status and identify specific nutrition problems.
6. Determine nutrition diagnoses and write appropriate PES statements.
7. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Williams, Dorothy, *Female, 49 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *R Levin* **Date:** *6/5*

iStock.com/FangXiaNuo

Patient Summary: 49-year-old female here for evaluation and treatment for recently diagnosed gastroparesis.

History:

Onset of disease: Patient has been experiencing increased nausea over the past 6 months. She has had some indigestion in the past and has been diagnosed with a hiatal hernia. Mrs. Williams recently underwent a gastric emptying scintigraphy test. Test results determined that 45% of the test meal was retained after 4 hours. She has now been referred to the outpatient gastroenterology clinic.
Medical history: Indigestion; hiatal hernia; GERD
Surgical history: s/p hysterectomy 2 years previous secondary to endometriosis; Nissen fundoplication 1 year ago for refractory GERD
Medications at home: Ranitidine 80 mg tab; omeprazole 20 mg cap DR
Tobacco use: None
Alcohol use: None
Family history: What? CAD, T2DM, cancer. Who? Parents, sister, and brother.

Demographics:

Marital status: Married—lives with husband and 4 children
Spouse name: Sam
Number of children: 4—ages 9, 11, 14, 16
Years education: High school
Language: English
Occupation: Administrative assistant for local elementary school
Hours of work: M–F, works consistently in evenings and on weekends as well
Ethnicity: African American
Religious affiliation: African Methodist Episcopal

MD Progress Note:

Vital Signs:

Temp: 98.6°F	Pulse: 72	Resp rate: 122
BP: 128/82	Height: 5'6"	Weight: 126 lbs

HEENT: Head: normocephalic and atraumatic
Eyes: pupils equal and reactive to light; extraocular muscles intact; sclerae anicteric; conjunctivae are pink
Ears: no obvious hearing loss
Nose: nasal congestion
Throat: oropharynx exam reveals the mucous membranes to be moist. The tongue is midline. The uvula elevates with phonation. The teeth are in good state of repair.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Williams, Dorothy, *Female, 49 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *R Levin* **Date:** *6/5*

Cardiac: No carotid bruits
Pulmonary/chest: Lungs clear to auscultation and percussion. The AP diameter is normal.
Abdominal: The abdomen is soft and nontender to palpation. There is no guarding, rebound tenderness, or rigidity. Normal, active bowel sounds are heard in all quadrants. No masses or organomegaly are noted.
Extremities: No edema; normal strength, sensations, and DTR
Neurological: Oriented × 4. The patient is alert and fully oriented with an appropriate affect.
Skin: Warm, dry, no rash or jaundice
Psychiatric: Negative

Assessment and Plan:

Dx: Gastroparesis

Medical Tx plan: Continue ranitidine 80 mg tab; omeprazole 20 mg cap DR daily; start metoclopramide 10 mg four times daily. Nutrition consult.

R. Levin, MD

Nuclear Medicine Result
Exam: Gastric emptying scintigraphy=W
Comparison: No prior GES studies are available for comparison.
Clinical history: 49-y.o. woman who presents with nausea and vomiting. The study is requested for evaluation of gastric emptying.
Relevant medications taken by patient within 2 days prior to this study (as reported by the patient): None
Technique: Tc99m sulfur colloid 0.54 mCi was mixed with 120 g of EggBeaters (commercial egg white preparation; equivalent to two eggs) and subsequently scrambled. The patient consumed this radiolabeled meal orally along with 2 slices of bread, 20 g margarine, and 120 mL water. Images of the abdomen in anterior and posterior projections were acquired immediately after meal consumption and at 1, 2, and 4 hours after meal consumption. Region of interest analysis (via geometric mean) was used to calculate percent retained gastric activity at 1, 2, and 4 hours after meal consumption. *Findings:* At 60 minutes after meal consumption, 87% of initial gastric contents were retained within the stomach (normal range, 30–90%). At 120 minutes after meal consumption, 68% of initial gastric contents were retained within the stomach (normal range, <60%). At 240 minutes after meal consumption, 45% of initial gastric contents were retained within the stomach (normal range, <10%). *Reference:* Abell TL, et al. Consensus recommendations for gastric emptying scintigraphy: A joint report of the American Neurogastroenterology and Motility Society and the Society of Nuclear Medicine. *Am J Gastroenterology* 2007;102:1–11.
Electronically signed by: Smith L. (Physician) 5/26

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Williams, Dorothy, *Female, 49 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *R Levin* **Date:** *6/5*

Impression: Scintigraphic findings are abnormal at 1, 2, and 4 hours. Dx: Abnormal gastric emptying study consistent with gastroparesis.

Nutrition:

History: Patient relates she has lost more than 40 lbs over the previous year following her Nissen fundoplication. She describes constant nausea and vomiting episodes 2–3 times per week over the previous 6 months. She states that she is never hungry but has to make herself eat. She cooks regularly for her family and she tries to eat a little bit whenever she prepares these meals. She takes soup or leftovers for lunch at her job. She has stopped eating meats as they cause a lot of abdominal pain. Mrs. Williams states that she tolerates drinking beverages better than she does eating solid foods.

Usual dietary intake:

AM:	Approx. 2 scrambled eggs with cheese, few bites of toast with butter, ½ c berries; coffee with milk and sugar
Lunch:	Soup—cream of potato with bacon bits and cheese—½ c; Sprite
Snack when she comes home:	Yogurt or 4 oz chocolate milk with ½ c fruit salad
PM:	½ c pasta with cheese; mashed potatoes or salad
Late PM:	½ can Ensure or 4 oz milk

Food allergies/intolerances/aversions: Meats, spicy foods, fried foods make symptoms worse
Previous nutrition therapy? No
Food purchase/preparation: Self
Vit/min intake: None

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Williams, Dorothy, *Female, 49 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *R Levin* **Date:** *6/5*

Laboratory Results

	Ref. Range	6/5
Chemistry		
Sodium (mEq/L)	136–145	138
Potassium (mEq/L)	3.5–5.1	4.1
Chloride (mEq/L)	98–107	101
Carbon dioxide (mEq/L)	23–29	23
BUN (mg/dL)	6–20	6
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	0.6
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	2.9
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	89
Glucose (mg/dL)	70–99	78
Phosphate, inorganic (mg/dL)	2.2–4.6	2.4
Magnesium (mg/dL)	1.5–2.4	1.5
Calcium (mg/dL)	8.6–10.2	8.98
Bilirubin total (mg/dL)	≤1.2	0.4
Bilirubin, direct (mg/dL)	<0.3	0.01
Protein, total (g/dL)	6–7.8	6.0
Albumin (g/dL)	3.5–5.5	3.5
Prealbumin (mg/dL)	18–35	21
Alkaline phosphatase (U/L)	30–120	81
ALT (U/L)	4–36	5
AST (U/L)	0–35	11
CPK (U/L)	30–135 F 55–170 M	62
Lactate dehydrogenase (U/L)	208–378	217
Cholesterol (mg/dL)	<200	150
HDL-C (mg/dL)	>50 F, >40 M	62
VLDL (mg/dL)	7–32	15
LDL (mg/dL)	0–99	82

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Williams, Dorothy, *Female, 49 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *R Levin* **Date:** *6/5*

Laboratory Results *(Continued)*

	Ref. Range	6/5
LDL/HDL ratio	<4.5	1.58
Triglycerides (mg/dL)	<150	78
HbA_{1C} (%)	<5.7	5.3
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	6.2
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	4.8
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	10.5 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	34 !↓
Mean cell volume (μm^3)	80–96	71 !↓
Mean cell Hgb (pg)	28–32	22 !↓
Mean cell Hgb content (g/dL)	32–36	24 !↓
RBC distribution (%)	11.6–16.5	17.5 !↑
Hematology, Manual Diff		
Neutrophil (%)	40–70	42
Lymphocyte (%)	22–44	22
Monocyte (%)	0–7	3
Eosinophil (%)	0–5	0
Basophil (%)	0–2	0
Blasts (%)	3–10	3
Urinalysis		
Collection method	—	Clean catch
Color	—	Amber
Appearance	—	Clear
Specific gravity	1.001–1.035	1.034
pH	5–7	6.3
Protein (mg/dL)	Neg	Neg
Glucose (mg/dL)	Neg	Neg
Ketones	Neg	+ !↑

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Williams, Dorothy, *Female, 49 y.o.*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *R Levin* **Date:** *6/5*

Laboratory Results *(Continued)*

	Ref. Range	6/5
Blood	Neg	Neg
Bilirubin	Neg	Neg
Nitrites	Neg	Neg
Urobilinogen (EU/dL)	<1.0	0.009
Leukocyte esterase	Neg	Neg
Prot chk	Neg	+ !↑
WBCs (/HPF)	0–5	0
RBCs (/HPF)	0–2	0
Bact	0	0
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. Identify the major physiological controls for gastric emptying.

2. List the common etiologies that lead to a diagnosis of gastroparesis. Discuss the potential complication associated with a Nissen fundoplication that may lead to gastroparesis.

3. According to the American College of Gastroenterology, a 4-hour scintigraphy is the gold standard for diagnosis of gastroparesis. This test was performed on Mrs. Williams. Explain this test and discuss how the results confirm her diagnosis. Are there other diagnostic tests that could be used?

4. What are the common signs and symptoms of gastroparesis? Explain how these symptoms may lead to nutritional deficits. Did Mrs. Williams have any of these signs or symptoms consistent with a diagnosis of gastroparesis?

5. What are the current medical and surgical treatment options for gastroparesis? Metoclopramide was started to improve Mrs. Williams's symptoms associated with gastroparesis. What is the role of this medication in the management of gastroparesis? What are the concerns related to adverse effects related to its use?

II. Understanding the Nutrition Therapy

6. Summarize the current recommendations for nutrition therapy for gastroparesis. Review the patient's 24-hour recall and provide at least 3 recommendations to modify her diet. Explain why each may assist with control of symptoms or improve nutritional status.

7. If a patient with gastroparesis is not able to meet his or her nutritional needs orally, what type of enteral feeding recommendations are appropriate?

III. Nutrition Assessment

8. Calculate the patient's %UBW and BMI. What does this assessment of weight tell you?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

9. Calculate energy and protein requirements for Mrs. Williams. Explain how you determined these recommendations.

10. Estimate her caloric intake from her usual dietary intake. How does this compare to your calculated energy requirements?

11. Are there any abnormal labs that should be addressed to improve Mrs. Williams's overall health? Explain the possible cause(s) for each abnormal lab result.

IV. Nutrition Diagnosis

12. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

13. Determine the appropriate intervention for each nutrition diagnosis.

VI. Evaluation and Monitoring

14. Identify measurable outcomes for each of your interventions. What are possible nutrition concerns that you may want to address in a follow-up visit with Mrs. Williams?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Nutrition Care Manual. https://www.nutritioncaremanual.org/client_ed.cfm?ncm_client_ed_id=165. Accessed January 24, 2020.

Acosta A, Camilleri C. Prokinetics in gastroparesis. *Gastroenterol Clin N*. 2015;44:97–111.

Avalos D, Nalik P, McCallum R. Understanding the etiology and spectrum of idiopathic gastroparesis. *Prac Gastroenterol*. 2017;38–50.

Camilleri M, Parkman H, Shafi M, Abell T, Gerson L. Clinical guideline: Management of gastroparesis. *Am J Gastroenterol*. 2013;108:18–37.

Davis JL, Ripley RT. Postgastrectomy syndromes and nutritional considerations following gastric surgery. *Surg Clin N Am*. 2017;97:277–293.

Fisher K, Touger-Decker R, Ziegler J. Medical nutrition therapy for symptom management in adults with gastroparesis. *Top Clin Nutr*. 2018;33:320–334.

Hasler WL. Symptomatic management for gastroparesis. *Gastroenterol Clin N*. 2015;44:113–126.

Homko CJ, Duffy F, Friedenberg FK, Boden G, Parkman HP. Effect of dietary fat and food consistency on gastroparesis symptoms in patients with gastroparesis. *Neurogastroenterol Motil*. 2015;27:501–508.

Keller J, Bassotti G, Clarke J, et al. Advances in the diagnosis and classification of gastric and intestinal motility disorders. *Nat Rev Gastro Hepat*. 2018;15:291–308.

Lee LA, Chen J, Yin J. Complementary and alternative medicine for gastroparesis. *Gastroenterol Clin N*. 2015;44:137–150.

Lu D, Altieri M, Yang J, et al. Investigating rates of reoperation or postsurgical gastroparesis following fundoplication or paraesophageal hernia repair in New York State. Surgical Endoscopy. 2018;33:2886–2894.

Myint AS, Rieders B, Tashkandi M, et al. Current and emerging therapeutic options for gastroparesis. *Gastroenterol Hepatol.* 2018;14:639–645.

Nahikian-Nelms ML. Nutrition assessment: Foundation of the nutrition care process. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:38–75.

Navas CM, Patel NK, Lacy BE. Gastroparesis: Medical and therapeutic advances. *Dig Dis Sci.* 2017;62:2231–2242.

Nelms MN. Diseases of the upper gastrointestinal tract. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:342–378.

Nguyen LA, Snape WJ. Clinical presentation and pathophysiology of gastroparesis. *Gastroenterol Clin N*. 2015;44:21–30.

Pronsky ZM, Crowe JP. *Food and Medication Interaction*. 19th ed. Birchrunville, PA: Food-Medication Interactions; 2018.

Rees-Parrish C. Nutritional considerations in the patient with gastroparesis. *Gastroenterol Clin N*. 2015;44:83–95.

Sherwood L. The digestive system. In *Human Physiology from Cells to System*. 9th ed. Boston, MA: Cengage Learning; 2016:565–617.

von Arnim U. [Gastroparesis. Definition, diagnostics, and therapy]. *Internist* (Berl). 2015;56:625–630.

Internet Resources

American College of Gastroenterology: Gastroparesis: http://patients.gi.org/topics/gastroparesis/

Mayo Clinic: Gastroparesis: http://www.mayoclinic.org/diseases-conditions/gastroparesis/basics/definition/con-20023971

National Institute of Diabetes and Digestive and Kidney Diseases: Gastroparesis: http://www.niddk.nih.gov/health-information/health-topics/digestive-diseases/gastroparesis/Pages/facts.aspx

University of Virginia Digestive Health Center: Diet Interventions for Gastroparesis: https://med.virginia.edu/ginutrition/wp-content/uploads/sites/199/2014/04/Gastroparesis-Long-Version-02.23.17.pdf

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Four

NUTRITION THERAPY FOR LOWER GASTROINTESTINAL DISORDERS

The next three cases explore conditions affecting the small and large intestines. These conditions, whose etiologies are all different, involve the symptoms of diarrhea, constipation, malabsorption, and maldigestion. In all three cases, medical nutrition therapy is a crucial component of the individual's care.

Celiac disease, explored in Case 9, is an autoimmune disease triggered by exposure to gliadin, a protein found in the gluten portion of wheat, rye, and barley. This case explores the physical presentation of celiac disease in a pediatric patient, diagnostic procedures for celiac disease, the potential impact on growth and development, the use of the gluten-free diet as medical nutrition therapy, and the complexities within the household and school environment.

Case 10 examines irritable bowel syndrome (IBS), which is the most common gastrointestinal complaint in the United States and Canada. The improved recognition and understanding of IBS in recent years has allowed for development of additional treatments. The use of the low-FODMAP diet for management of symptoms related to irritable bowel syndrome is now commonplace in outpatient gastroenterology clinics. The use of this case will highlight strategies for assessing the FODMAP content of the diet using a typical dietary recall. The role of the microbiome in IBS and the use of pre- and probiotics as a method of treatment are discussed. This case highlights a vitamin D deficiency as a common biochemical abnormality; however, the role of the RDN in assessment and treatment can provides an additional teaching opportunity showcasing the skillset of the RDN. Case 11 targets inflammatory bowel disease—Crohn's disease and short bowel syndrome. This case pushes the student to connect normal digestion and absorption to the altered anatomy of a patient undergoing a surgical resection of the gastrointestinal tract. The student is faced with many assessment challenges, including intestinal absorption, micronutrient assessment, and the need for specialized nutrition support. This case can be tailored to implement hands-on learning in the classroom by having the students practice drawing the reconfigured gastrointestinal tract to emphasize altered digestion and absorption.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 9

Celiac Disease

Meghan is a 3-year-old child who has been complaining of stomach pain and has recently been refusing to eat at mealtime. She has been experiencing diarrhea, which is new to her. After trying several modifications to her diet without improvement and after experiencing a significant weight loss, her pediatrician refers her to the outpatient pediatric gastroenterology clinic, where she is evaluated for a possible diagnosis of celiac disease.

Objectives

After completing this case, the student will be able to:

1. Apply knowledge of the pathophysiology of celiac disease to identify and explain common nutritional problems associated with the disease.
2. Apply knowledge of nutrition therapy for celiac disease.
3. Analyze nutrition assessment data to evaluate nutritional status and identify specific nutrition problems in the pediatric patient.
4. Determine nutrition diagnoses and write appropriate PES statements.
5. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Perry, Meghan, *Female, 3 y. 5 months*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *R. Smith* **Date:** *1/5*

Olesya Kuznetsova/Shutterstock.com

Patient Summary: 3-year, 5-month-old female here for evaluation of symptoms of abdominal pain, diarrhea, lack of appetite, and weight loss.

History:

Onset of disease: Mother and grandmother relate that Meghan has had increasing episodes of diarrhea over the last 3 months. Meghan complains that her stomach hurts and often refuses to eat at mealtime. Their pediatrician had recommended periodic use of the BRAT diet and removal of milk and dairy products from her diet. This has not made a difference in Meghan's symptoms. Their pediatrician, upon noting the amount of weight that Meghan has lost, referred them to the gastroenterology clinic.
Wt. four months previous was 16.3 kg and Ht. was 89 cm.
Mother's obstetrical and birth history: Nulliparous prior to conception. Consistent and adequate prenatal care throughout pregnancy. All maternal screening tests were negative. Delivered at 39W2D; 7 lbs 14 oz. Spontaneous vaginal delivery was uneventful. The mother did not smoke, drink, or use recreational drugs during the pregnancy.
Newborn screen was negative.
PHM: No significant medical history except for recurrent otitis media during first 24 months.
Surgical history: N/A
Allergies: NKKA
Meds: None
Family History:

1. Father: Alive and well at age 30
2. Mother: Hx of thyroid disease, age 27
3. Aunt: T1DM, age 24
4. Maternal grandmother: T2DM diagnosed at age 67, alive at age 70
5. Paternal grandfather: passed away from stroke at age 85

Demographics:

Language: English only
Social history: Lives with mother, grandmother. No siblings. Parents are separated and mother has primary custody. Mother is an RN in family practice. Grandmother is retired. Meghan attends daycare full-time.
Ethnicity: Caucasian/African American
Religious affiliation: Methodist

Physical Exam
General appearance: Appears lethargic; thin three-year-old
HEENT: Head: normocephalic and atraumatic
Eyes: pale sclera, noninjected conjunctiva
Mouth: oral mucosa pink, no dental caries
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Perry, Meghan, *Female, 3 y. 5 months*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *R. Smith* **Date:** *1/5*

Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Soft, nontender, with normoactive bowel sounds in all four quadrants. No masses, no organomegaly. No guarding, rebound, or CVA tenderness.
Extremities: Normal range of motion in all four extremities. No cyanosis or clubbing or peripheral edema.
Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Pale; no history of rashes, eczema, tearing, or itchiness.

Vital Signs: Temp: 98.2°F | Pulse: 78 | Resp rate: 21
BP: 85/52 | Height: 90 cm (<7% tile) | Weight: 11 kg (<5% tile) | BMI: 13.6 <5% tile
Wt/Stature z-score: –3.9

Assessment and Plan:
3-year, 7-month-old female with lethargy, diarrhea, abdominal pain, poor appetite, and weight loss.

Dx: R/O celiac disease

Medical Tx plan: IgA-tTG, total serum IgA, IgG-tTG, Chem 24, hematology with differential gluten-free diet, nutrition consult.

..... R. Smith, MD

Nutrition:
History: Mother describes that previously Meghan had a good appetite and typically ate most foods that were offered and that she was a "great eater." For the past 3–4 months, Meghan has started to refuse to eat at some meals as her stomach hurts when she eats. She previously had formed stools daily and now she has diarrhea after she eats. Mother and grandmother state they are worried about Meghan's weight loss. Weight four months ago was 16.3 kg and Ht. 89 cm.

Usual dietary intake—when at home:

AM:	Instant oatmeal or Cheerios; banana or berries; milk
Lunch:	peanut butter and jelly sandwich (1 slice ww bread, 1 tbsp peanut butter, 1 tsp grape jelly), 1 c applesauce, 4 oz milk
Dinner:	½ c spaghetti, ½ c marinara sauce with ground beef, 1 T green beans, 1 slice garlic bread
Snacks:	dried fruit, cookies, pretzels, granola bars

Food allergies/intolerances/aversions: None
Previous nutrition therapy? No

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Perry, Meghan, *Female, 3 y. 5 months*
Allergies: *NKA*
Pt. Location: *University Gastroenterology Clinic* **Physician:** *R. Smith* **Date:** *1/5*

Food purchase/preparation: Daycare—breakfast, 2 snacks, lunch; dinner and bedtime snack at home. Mother and grandmother responsible for primary meal preparation and shopping. One to two times per month Meghan spends time with father and paternal grandparents.
Vit/min intake: Chewable multivitamin

Laboratory Results

	Ref. Range	2/13 1634
Chemistry		
Sodium (mEq/L)	136–145	143
Potassium (mEq/L)	3.5–5.0	4.7
Chloride (mEq/L)	98–108	101
Carbon dioxide (mEq/L)	22–30	25
BUN (mg/dL)	5–18	11
Creatinine serum (mg/dL)	≤1.2	0.9
Glucose (mg/dL)	70–99	72
Phosphate, inorganic (mg/dL)	2.2–4.6	4
Magnesium (mg/dL)	1.6–2.6	2.4
Calcium (mg/dL)	8.6–10.5	10.5
Bilirubin total (mg/dL)	≤1.2	1.1
Protein, total (g/dL)	6–7.8	7.8
Albumin (g/dL)	3.5–5	4.9
Prealbumin (mg/dL)	17–39	21
Alkaline phosphatase (U/L)	<500	325
ALT (U/L)	3–28	18
AST (U/L)	19–28	25
(tTG) Antibody, (IgA)	<4 U/mL No antibody detected	8 U/mL ↑! Antibody detected
IgA, Serum (3–5 years)	22–140 mg/dL	
DQ2 (DQA1 0501/0505,DQB1 02XX)	Negative	Positive ↑!
DQ8 (DQA1 03XX, DQB1 0302)	Negative	Positive ↑!
Hematology		
Hemoglobin (g/dL)	11–16	9.5 !↓
Hematocrit (%)	31–43	27 !↓
Vitamin D 25 hydroxy (ng/mL)	30–100	16 !↓

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. What is the etiology of celiac disease? Is anything in Meghan's family history typical of patients with celiac disease? Explain. The prevalence of celiac disease appears to be increasing. What does the current literature suggest as contributors to this change in celiac disease prevalence?

2. tTG antibodies are used in serological testing to diagnose celiac disease. Each test is sensitive and specific for the antibody it measures. The tTG test has a sensitivity 95–98%. What does this mean? It also has a specificity of 94–95%. What does this mean? What lab results would allow the physician to avoid the small intestine biopsy?

3. Historically, the biopsy of the small intestine has been the "gold standard" for diagnosis of celiac disease. What are the histological changes that may be observed on this biopsy that correlate with the physiological changes that occur because of damage from the celiac disease?

II. Understanding the Nutrition Therapy

4. Gluten restriction is the major component of the medical nutrition therapy for celiac disease. What is gluten? Where is it found?

5. Can patients on a gluten-free diet tolerate oats?

6. Are there any known health benefits of following a gluten-free diet if a person does not have celiac disease?

7. Can patients with celiac disease also be lactose intolerant?

III. Nutrition Assessment

8. Assess Meghan's Ht/Age, Wt/Age, Ht/Wt, and BMI using the appropriate CDC growth charts. What are z-scores and how are they used to assess growth?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

9. What are the characteristics of pediatric malnutrition? Is Meghan at risk? What information is needed for this diagnosis to be made?

10. Calculate Meghan's optimal energy and protein requirements to promote optimal growth.

11. Evaluate Meghan's laboratory measures for nutritional significance. Identify all laboratory values that are indicative of a potential nutrition problem.

12. Are the abnormalities identified in question 11 related to the consequences of celiac disease? Explain.

IV. Nutrition Diagnosis

13. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

14. For each of the PES statements that you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).

15. What type of diet would you initially prescribe, considering the possibility that Meghan has suffered intestinal damage?

VI. Nutrition Monitoring and Evaluation

16. What is the optimal weight and stature goals for Meghan? How would you monitor this?

17. Evaluate the following excerpt from Meghan's food diary. Identify the foods that may not be tolerated on a gluten-/gliadin-free diet. For each food identified, provide an appropriate substitute.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

BREAKFAST—cornflakes, milk, banana

LUNCH—hot dog on bun, French fries, chocolate milk

DINNER—stir-fry chicken nuggets with soy sauce, mixed vegetables on rice; pudding, milk

SNACK—gluten-free graham crackers with peanut butter; cookie dough ice cream

18. Outline the major components that need to be addressed for comprehensive celiac nutrition therapy education.

19. Meghan's mother and grandmother are worried about how to ensure a gluten-free diet is provided for Meghan at her father's home as well as at daycare. What are the major steps she should take to keep Meghan from being exposed to gluten at home, at her father's home, and at daycare, since others do not have celiac disease? What advice would you give her? Are there other potential environmental sources of gluten that Meghan's mother should be aware of?

20. Are there any potential long-term nutritional concerns for Meghan while following the gluten-free diet? As Meghan's RDN, what would you monitor to make sure that Meghan maintains optimal health?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Nutrition Care Manual. https://www.nutritioncaremanual.org/topic.cfm?ncm_toc_id=22684. Accessed February 21, 2020.

Al-Toma A, Volta U, Auricchio R, et al. European Society for the Study of Coeliac Disease (ESsCD) guideline for coeliac disease and other gluten-related disorders. *United European Gastroenterol J*. 2019;83–613.

Becker P, Carner LN, Corkins MR, et al. Consensus statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Indicators recommended for the identification and documentation of pediatric malnutrition. *Nutr Clin Prac*t. 2015;30:147–161.

Food labeling; gluten-free labeling of foods. federalregister.gov. https://federalregister.gov/d/2013-18813. Published August 5, 2013. Accessed February 13, 2020.

Da Silva J, Seres D, Sabino K, et al. ASPEN Consensus Recommendations for Refeeding Syndrome. *Nutr in Clin Prac*. 2020;35(2):178–196.

Guandalini S, Newland C. Differentiating food allergies from food intolerances. *Curr Gastroenterol Rep.* 2011;13:426–434.

Husby S, Koletzko S, Korponay-Szabo I, et al. European Society for Paediatric Gastroenterology, Hepatology and Nutrition guidelines for diagnosing coeliac disease 2020. *J Pediatr Gastroenterol Nutr*. 2019.

Husby S, Murray JA, Katzka DA. AGA clinical practice update on diagnosis and monitoring of celiac disease—changing utility of serology and histologic measures: Expert review. *Gastroenterology*. 2019;156:885–889.

Latorre M, Lagana SM, Freedberg DE, et al. Endoscopic biopsy technique in the diagnosis of celiac disease: One bite or two? *Gastrointest Endosc*. 2015;81:1–6.

Mederios D, Wildman R. *Advanced Human Nutrition*. 4th ed. Burlington, MA: Jones & Bartlett Learning; 2018.

Nahikian-Nelms ML. Diseases and disorders of energy imbalance. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:254–295.

Nahikian-Nelms ML. Nutrition assessment: Foundation of the nutrition care process. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:38–75.

Pronsky ZM, Crowe JP. *Food and Medication Interaction,* 19th ed. Birchrunville, PA: Food-Medication Interactions; 2018.

Roberts KM, Nahikian-Nelms M. Diseases of the lower gastrointestinal tract. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2016:379–434.

Riddle MS, Murray JA, Porter CK. The incidence and risk of celiac disease in a healthy US adult population. *Am J Gastroenterol.* 2012;107:1248–1255.

Rubio-Tapia A, Murray JA. Updated guidelines by the European Society for the Study of Coeliac Disease. *United European Gastroenterol J*. 2019;7(5):581–582.

Sue A, Dehlsen K, Ooi CY. Paediatric patients with coeliac disease on a gluten-free diet: Nutritional adequacy and macro- and micronutrient imbalances. *Curr Gastroenterol Rep.* 2018;20:2.

Internet Resources

Celiac Disease Center at Columbia University: http://celiacdiseasecenter.columbia.edu/

Celiac Disease Foundation: http://www.celiac.org/

Celiac Support Association: http://www.csaceliacs.info/celiac_disease.jsp

National Digestive Diseases Information Clearinghouse (NDDIC): http://www.niddk.nih.gov/health-information/health-topics/digestive-diseases/celiac-disease/Pages/ez.aspx

National Library of Medicine/National Institutes of Health Medline Plus: http://www.nlm.nih.gov/medlineplus/celiacdisease.html

Nestle Health Science: https://www.nestlehealthscience.us/asset-library/documents/resources/pediatric%20helpful%20hints.pdf

Peditools: https://peditools.org/

University of Chicago Celiac Disease Center: http://www.cureceliacdisease.org/

USDA Nutrient Data Laboratory: http://www.ars.usda.gov/nutrientdata

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 10

Irritable Bowel Syndrome

Alicia Clarke is a 42-year-old female who presents to the gastroenterology clinic with generalized stomach and intestinal complaints.

Objectives

After completing this case, the student will be able to:

1. Describe the proposed etiologies of irritable bowel syndrome (IBS).
2. Use the current medical diagnostic criteria to identify IBS signs and symptoms found within the patient's history and physical exam.
3. Assess the nutritional status for an individual with IBS.
4. Understand the proposed mechanisms of avoidance of fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAP) as a component of medical nutrition therapy.
5. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses for this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Clarke, Alicia, *Female, 42 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Gastroenterology Clinic* **Physician:** *A. Mohammed, MD* **Date:** *3/30*

Tap10/Shutterstock.com

Patient Summary: Alicia Clarke is a 42-year-old female who presents to the outpatient gastroenterology clinic with stomach and intestinal complaints.

History:

Onset of disease: Patient presents upon referral from her family practice physician after experiencing both diarrhea and constipation for many years. Family physician found negative stool cultures. Colonoscopy negative for active disease.
Medical history: Hypothyroidism, gastroesophageal reflux disease, obesity
Surgical history: Caesarean × 2
Medications at home: omeprazole 50 mg twice daily; levothyroxine 25 mcg; vitamin D 600 IU daily; 800 mg calcium daily; diphenoxylate atropine prn
Tobacco use: 1 ppd × 10 years—quit at age 30
Alcohol use: 3–4 × per week
Family history: Father—HTN, atherosclerosis; mother, sister—hypothyroidism, T2DM

Demographics:

Marital status: Divorced; 2 children—ages 12 and 14
Years education: 16 years
Language: English only
Occupation: Kindergarten teacher
Hours of work: 8–4 weekdays
Household members: Self, two children, and mother. Ex-husband lives in same city and shares custody of children.
Ethnicity: Caucasian
Religious affiliation: Methodist

History/Physical:

Chief complaint: "I am here for a workup of my stomach and intestinal problems. My family doctor did some tests but did not find anything. I have always had a 'funny' stomach, I think. As far back as I can remember, I have had times when I had diarrhea and others when I would go for days without going to the bathroom. The diarrhea is much worse now and I have had several accidents when I didn't make it to the bathroom. This is really interfering with my daily life." Patient describes ongoing abdominal pain almost every day with alternating constipation and diarrhea. She also describes having significant bloating and gas on some days. Diarrhea has been more predominant lately with several episodes per day.
General appearance: Obese, anxious-appearing female

Vital Signs:	Temp: 98.6°F	Pulse: 100	Resp rate: 16
	BP: 128/72	Height: 5'5"	Weight: 191 lbs

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Clarke, Alicia, *Female, 42 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Gastroenterology Clinic* **Physician:** *A. Mohammed, MD* **Date:** *3/30*

HEENT: Head: WNL
Eyes: PERRLA
Ears: clear
Nose: clear
Throat: dry mucous membranes without exudates or lesions
Cardiac: Regular rate and rhythm
Genitalia: Deferred
Pulmonary/chest: WNL—clear to auscultation and percussion
Abdominal: Hyperactive bowel sounds × 4; no organomegaly or masses—lower abdominal tenderness
Extremities: WNL
Neurological: Alert and oriented × 3
Skin: Warm and dry
Psychiatric: Negative

Assessment/Plan:
Patient meets Rome IV criteria for IBS. Will begin amitriptyline 25 mg daily. Initiate psyllium 1 tbsp in 8 oz of liquid twice daily; diphenoxylate atropine PRN. Schedule laboratory for hydrogen breath test, anti-tTG. Nutrition consult. Patient to return to clinic in four weeks.

..... A. Mohammed, MD

Nutrition:
History: Patient states that her appetite is good even with her abdominal pain and diarrhea. She has steadily gained weight since her pregnancies and in the last 5 years has gained over 20 lbs. She feels that there is not any one food that causes diarrhea more than others. She does notice more gas after eating foods like beans or cauliflower. She likes most foods—likes to cook and prepares most meals at home. Patient states that she has been trying to follow a high-fiber diet so that it might help with her gastrointestinal symptoms. Patient also asks if her yogurt intake will provide enough probiotics, as she has heard she needs to balance the bacteria in her intestines. She does admit that she isn't quite sure what that means.

24-Hour Recall

AM:	Homemade yogurt smoothie with 1 c fresh fruit (peaches and cherries), 1 8-oz yogurt, or dry cereal with dried fruit, nuts mixed with yogurt; 2–3 c coffee with half and half and artificial sweetener
Mid-morning:	Diet Pepsi, ½ c dried fruit and nuts
Lunch:	Salad with kidney beans or lentils, cheese, tomatoes, carrots, asparagus, salad dressing; wheat crackers—approx. 12–15, water
PM:	Some type of meat—varies, but mostly chicken; pasta or potatoes, variety of vegetables, some type of bread or roll with butter
Snacks:	Ice cream, cake, or cookies, usually each night but lately has been trying to eat sugar-free candies to help with weight loss. Wine or beer—2–3 times per week.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Clarke, Alicia, *Female, 42 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Gastroenterology Clinic* **Physician:** *A. Mohammed, MD* **Date:** *3/30*

Laboratory Results

	Ref. Range	3/30 0800
Chemistry		
Sodium (mEq/L)	136–145	141
Potassium (mEq/L)	3.5–5.1	3.7
Chloride (mEq/L)	98–107	101
Carbon dioxide (mEq/L)	23–29	25
BUN (mg/dL)	6–20	11
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	0.7
BUN/Crea ratio	10.0–20.0	15.7
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	4.2
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	124
Glucose (mg/dL)	70–99	115 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	3.1
Magnesium (mg/dL)	1.5–2.4	1.8
Calcium (mg/dL)	8.6–10.2	10.1
Osmolality (mmol/kg/H_2O)	275–295	292
Bilirubin total (mg/dL)	≤1.2	0.2
Bilirubin, direct (mg/dL)	<0.3	0.1
Protein, total (g/dL)	6–7.8	6.2
Albumin (g/dL)	3.5–5.5	4.1
Prealbumin (mg/dL)	18–35	22
Ammonia (µg/L)	6–47	11
Alkaline phosphatase (U/L)	30–120	35
ALT (U/L)	4–36	6
AST (U/L)	0–35	1
CPK (U/L)	30–135 F 55–170 M	114
Lactate dehydrogenase (U/L)	208–378	271
Cholesterol (mg/dL)	<200	201 !↑
HDL-C (mg/dL)	>50 F, >40 M	42 !↓
VLDL (mg/dL)	7–32	36

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Clarke, Alicia, *Female, 42 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Gastroenterology Clinic* **Physician:** *A. Mohammed, MD* **Date:** *3/30*

Laboratory Results *(Continued)*

LDL (mg/dL)	0–99	122 ↑
LDL/HDL ratio	<4.5	2.90
Triglycerides (mg/dL)	<150	181 !↑
T_4 (µg/dL)	5–12	6
T_3 (µg/dL)	75–98	79
HbA_{1C} (%)	<5.7	6.1 !↑
25-OH vitamin D (ng/mL)	25–80	15 !↓
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	5.5
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	5.1
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	12.1
Hematocrit (Hct, %)	37–47 F 41–51 M	37

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. IBS is considered to be a functional disorder. What does this mean? How does this relate to Mrs. Clarke's history of having a colonoscopy and her physician's order for a hydrogen breath test and measurements of anti-tTG?

2. What are the Rome IV criteria that were used as part of Dr. Mohammed's diagnosis? Using the information from Mrs. Clarke's history and physical, determine how Dr. Mohammed made his diagnosis of IBS.

3. Discuss the primary factors that may be involved in IBS etiology. You must include in your discussion the possible roles of genetics, infection, and serotonin.

4. Mrs. Clarke's physician prescribed two medications for her IBS. What are they and what is the proposed mechanism of each? She discusses the potential use of alosetron if these medications do not help. What is this medication and what is its mechanism? Identify any potential drug–nutrient interactions for these medications.

II. Understanding the Nutrition Therapy

5. What is a FODMAP? For each of the following foods, outline the possible effect on IBS symptoms.

a. lactose

b. fructose

c. fructans/galacto-oligosaccharides

d. sugar alcohols

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

6. Describe the role of a low FODMAP diet as an intervention for IBS. What does the current literature tell us about this intervention?

7. Define the terms *prebiotic* and *probiotic*. What does the current research indicate regarding their use for treatment of IBS? What guidance would you give Mrs. Clarke for choosing a prebiotic and probiotic?

III. Nutrition Assessment

8. Assess Mrs. Clarke's weight and BMI. What is her desirable weight?

9. Identify any abnormal laboratory values measured at this clinic visit and explain their significance for the patient with IBS.

10. List Mrs. Clarke's other medications and identify the rationale for each prescription.

11. Determine Mrs. Clarke's energy and protein requirements. Be sure to explain what standards you used to make this estimation.

12. Assess Mrs. Clarke's recent diet history. How does this compare to her estimated energy and protein needs? Identify foods that may potentially aggravate her IBS symptoms.

IV. Nutrition Diagnosis

13. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

14. The RDN discusses the use of the FODMAP assessment to identify potential trigger foods. Describe the use of this approach for Mrs. Clarke. How might a food diary help her determine which foods she should avoid?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

15. Mrs. Clarke asks about her low vitamin D level. What is the role of the RDN in developing an appropriate intervention for Mrs. Clarke to treat her vitamin D deficiency? What guidance should the RDN provide when selecting a micronutrient supplement?

16. Mrs. Clarke is interested in trying other types of treatment for IBS, including acupuncture, herbal supplements, and hypnotherapy. What would you tell her about the use of each of these for IBS? What is the role of the RDN in discussing complementary and alternative therapies?

VI. Nutrition Monitoring and Evaluation

17. Write an ADIME note for your initial nutrition assessment with your plans for education and follow-up.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Nutrition Care Manual. Irritable Bowel Syndrome. https://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=1&lv1=5522&lv2=145209&ncm_toc_id=19589&ncm_heading=Nutrition%20Care. Accessed January 28, 2020.

Altobelli E, Del Negro V, Angeletti PM, Latella G. Low-FODMAP diet improved irritable bowel syndrome symptoms: A meta-analysis. *Nutrients*. 2017;9(9):1–19.

Chang L, Di Lorenzo C, Farrugia G, et al. Functional bowel disorders: A roadmap to guide the next generation of research. *Gastroenterol*. 2018;154(3):723–735.

Drossman DA. Functional gastrointestinal disorders: History, pathophysiology, clinical features and rome IV. *Gastroenterol*. 2016;150(6):1262–1279.

El-Salhy M, Ystad SO, Mazzawi T, Gundersen D. Dietary fiber in irritable bowel syndrome (Review). *Int J Mol Med*. 2017;40:607–613.

Ford AC, Moayyedi P, Chey WD, et al. American College of Gastroenterology monograph on the management of irritable bowel syndrome. *Am J Gastroenterol*. 2018;113(Suppl 2):S1–S18.

Ford AC, Quigley EM, Lacy BE, et al. Efficacy of prebiotics, probiotics, and synbiotics in irritable bowel syndrome and chronic idiopathic constipation: Systematic review and meta-analysis. *Am J Gastroenterol*. 2014;109(10):1547–1561.

Halmos EP, Christophersen CT, Bird AR, et al. Diets that differ in their FODMAP content alter the colonic luminal microenvironment. *Gut*. 2015;64:93–100.

Jalili M, Vahedi H, Poustchi H, et al. Effects of vitamin D supplementation in patients with irritable bowel syndrome: A randomized, double-blind, placebo-controlled clinical trial. *Int J Prev Med*. 2019;10:16.

Krogsgaard LR, Lyngesen M, Bytzer P. Systematic review: Quality of trials on the symptomatic effects of the low FODMAP diet for irritable bowel syndrome. *Aliment Pharmacol Ther*. 2017;45(12):1506–1513.

Lacy BE. The science, evidence and practice of dietary interventions in irritable bowel syndrome. *Clin Gastroenter Hep*. 2015;13:1899–1906.

Lorenzo-Zúñiga V, Llop E, Suárez C, et al. I.31, a new combination of probiotics, improves irritable bowel syndrome-related quality of life. *World J Gastroenterol*. 2014;20:8709–8716.

Manheimer E, Cheng K, Wieland LS, et al. Acupuncture for treatment of irritable bowel syndrome. *Cochrane Database Syst Rev*. 2012;5:CD005111.

Marsh A, Eslick EM, Eslick GD. Does a diet low in FODMAPs reduce symptoms associated with functional gastrointestinal disorders? A comprehensive systematic review and meta-analysis. *Eur J Nutr*. 2016;55(3):897–906.

Martinez RC, Bedani R, Saad SM. Scientific evidence for health affects attributed to the consumption of probiotics and prebiotics: An update for current perspectives and future challenges. *Br J Nutr*. 2015;114(12):1993–2015.

Pandey KR, Naik SR, Vakil BV. Probiotics, prebiotics, and symbiotics—a review. *J Food Sci Technol*. 2015;52(12):7577–7587.

Rej A, Avery A, Ford AC, et al. Clinical application of dietary therapies in irritable bowel syndrome. *J Gastrointestin Liver Dis*. 2018;27:307–316.

Roberts KM, Nahikian-Nelms M. Diseases of the lower gastrointestinal tract. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2016:379–434.

Rodiño-Janiero BK, Vicario M, Alonso-Cotoner C, Pascua-García R, Santos J. A review of microbiota and irritable bowel syndrome: Future in therapies. *Adv Ther*. 2018;35:289–310.

Schumann D, Klose P, Lauche R, Dobos G, Langhorst J, Cramer H. Low fermentable, oligosaccharides, di-, mono-saccharides, and polyol diet in the treatment of irritable bowel syndrome: A systematic review and meta-analysis. *Nutrition*. 2018;45:24–31.

Varjú P, Farkas N, Hegyi P, et al. Low fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAP) diet improves symptoms in adults suffering from irritable bowel syndrome (IBS) compared to standard IBS diet: A meta-analysis of clinical studies. *PLOS One*. 2017;12(8):e0182942.

Internet Resources

AND Evidence Analysis Library: http://www.andeal.org

DrugBank: http://www.drugbank.ca/

International Foundation for Functional Gastrointestinal Disorders: http://www.aboutibs.org/

Kate Scarlata: https://www.katescarlata.com/

Lotronex: https://www.lotronex.com/

MedicineNet: http://www.medicinenet.com

Nutrition Care Manual: http://www.nutritioncaremanual.org

Rome Foundation: https://theromefoundation.org/rome-iv/whats-new-for-rome-iv/

WebMD: http://www.webmd.com/ibs/alternative-therapies

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 11

Inflammatory Bowel Disease: Crohn's Disease and Short Bowel Syndrome

Sara Johnson was diagnosed with Crohn's disease 5½ years ago. She is now admitted with an acute exacerbation of that disease.

Objectives

After completing this case, the student will be able to:

1. Apply knowledge of the pathophysiology of Crohn's disease and short bowel syndrome (SBS) to identify and explain common nutritional problems associated with these diseases.
   a. Describe physiological changes resulting from Crohn's disease and surgical resections of the gastrointestinal tract.
   b. Identify nutritional consequences of Crohn's disease and SBS.
2. Describe common postoperative nutrition care concerns and the rationale for postoperative nutritional support.
3. Describe the types of ostomies that may result from gastrointestinal surgery.
4. Describe current medical care for Crohn's disease and SBS.
5. Identify potential drug–nutrient interactions among medications used to treat Crohn's disease.
6. Analyze nutrition assessment data to evaluate nutritional status and identify specific nutrition problems.
7. Determine nutrition diagnoses and write appropriate PES statements.
8. Calculate and evaluate parenteral nutrition formulations.
9. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Johnson, Sara, *Female, 42 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 2734* **Physician:** *T. Parker* **Admit Date:** *9/12*

stockyimages/Shutterstock.com

Patient Summary: Sara Johnson was hospitalized this past June with a fistula and acute exacerbation of Crohn's disease that required an ileal-colonic resection with a diverting loop ileostomy.

History:

Onset of disease: Dx Crohn's disease 5½ years ago
Medical history: Initial diagnostic workup indicated acute disease within last 70 of ileum. Regimens have included prednisone, azathioprine. Plans are to initiate infliximab.
Surgical history: 70 cm ileal resection at age 36; s/p 55 cm ileo-colonic resection this past June for an ileo-colonic fistula (30 cm ileum, ileocecal valve and 25 cm of the right colon resected per pathology reports).
Medications at home: azathioprine, loperamide, pantoprazole
Tobacco use: No
Alcohol use: Social
Family history: Grandfather reportedly with ulcerative colitis

Demographics:

Marital status: Single
Years education: Master's degree
Language: English only
Occupation: Small business owner
Hours of work: 7–5:30, occasional weekend hours
Ethnicity: Caucasian
Religious affiliation: Methodist

Admitting History/Physical:

Chief complaint: "I was diagnosed with inflammatory bowel disease over 5 years ago. At first they thought I had right-sided ulcerative colitis, but six months later it was identified as Crohn's disease. I was really sick at that time and ultimately needed an intestinal surgery. This past summer my symptoms started getting worse. I've noticed more diarrhea and abdominal cramping that has impacted my ability to run my business. I was admitted in June and I ended up having my second intestinal surgery when I got this temporary ileostomy to allow my colon to heal. We switched medicine to see if I could have better control of my disease. I was feeling better and I was able to restart some work from home, but now I can't eat because I am in so much pain. I am having a lot of ileostomy output throughout the night and it is worse when I eat."
General appearance: Thin, 42-year-old white female in apparent distress

Vital Signs:	Temp: 102.7°F	Pulse: 88	Resp rate: 21
	BP: 110/79	Height: 5"5"	Weight: 120 lbs

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Johnson, Sara, *Female, 42 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 2734* **Physician:** *T. Parker* **Admit Date:** *9/12*

HEENT: Eyes: PERRLA, normal fundi
Ears: noncontributory
Nose: noncontributory
Throat: pharynx clear
Cardiac: RRR without murmurs or gallops
Pulmonary/Chest: Lungs clear to auscultation bilaterally, normal percussion
Abdominal: Distension, extreme tenderness with rebound and guarding; rapid bowel sounds
Extremities: No edema; no bruits; normal strength, sensation, and DT
Neurologic: Oriented × 4
Skin: Warm, dry
Psychiatric: Appropriate mood and affect for acute clinical situation

Nursing Assessment	**9/12**
Abdominal appearance (concave, flat, rounded, obese, distended)	distended
Palpation of abdomen (soft, rigid, firm, masses, tense)	rigid, firm
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Ostomy color	greenish, brown
Ostomy consistency	mostly liquid
Genitourinary	
Urinary continence	catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	clear, yellow
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	H
Skin turgor (good, fair, poor, TENT=tenting)	fair
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Johnson, Sara, *Female, 42 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 2734* **Physician:** *T. Parker* **Admit Date:** *9/12*

Nursing Assessment *(Continued)*

Nursing Assessment	9/12
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact, D
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18=no risk, 15–16=low risk, 13–14=moderate risk, ≤12=high risk)	activity, 17

Orders:

R/O acute exacerbation of Crohn's disease vs. infection vs. recurrent fistula
CBC/Chem 24
ASCA
CT scan of abdomen and possible esophagogastroduodenoscopy
D5W NS @ 70 cc/hr
Clear liquids
Surgical consult
Nutrition support consult

Nutrition:

General: Patient states she has been eating fairly normally for the last year. After hospitalization at initial diagnosis, she had lost almost 20 lbs, which she regained after her first small bowel resection. She initially ate a low-fiber diet and worked hard to regain the weight she had lost. She uses her blender to make smoothies, which she has drunk from time to time between meals throughout the last year. Her usual weight before her illness was 145 lbs. She was at her highest weight (146 lbs) about 6 months ago but now states she has lost most of what she regained and has lost even more since her ileostomy surgery. When she was discharged after her hospitalization in June, she weighed 125 lbs postoperatively.

Recent dietary intake:

AM:	Oatmeal with lactaid milk, banana with cinnamon; coffee, black
AM snack:	Canned fruit, sometimes crackers
Lunch:	Soup, more canned fruit, chips, sports drink
Dinner:	Meat (all types), potato, some type of bread; rarely eats vegetables unless canned
Bedtime snack:	Cookies, chocolate lactaid milk

24-hr recall: Clear liquids for past 24 hours since admission
Food allergies/intolerances/aversions: NKA
Previous nutrition therapy? Yes. If yes, when: Last hospitalization.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Johnson, Sara, *Female, 42 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 2734* **Physician:** *T. Parker* **Admit Date:** *9/12*

What? "The dietitian talked to me about ways to thicken my ostomy output and how to keep from being dehydrated. We worked out a plan to help me regain the weight I had lost. I know what to do—it is just that the pain and constant stooling make my appetite so bad. It is really hard for me to eat."
Food purchase/preparation: Self
Vit/min intake: Multivitamin daily

Intake/Output

Weight: 54.5 kg

Date		**9/17 0701 – 9/18 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**NPO**	**NPO**	**NPO**	
	I.V.	**560**	**560**	**560**	**1680**
	(mL/kg/hr)	(1.3)	(1.3)	(1.3)	(1.3)
	I.V. piggyback				
	PN	**400**	**600**	**600**	**1600**
	Total intake	**960**	**1160**	**1160**	**3280**
	(mL/kg)	(17.6)	(21.3)	(21.3)	(60.2)
OUT	Urine	**600**	**780**	**520**	**1900**
	(mL/kg/hr)	(1.4)	(1.8)	(1.2)	(1.5)
	Emesis output				
	Other				
	Ostomy	**300**	**300**	**500**	**1100**
	Total output	**900**	**1080**	**1020**	**3000**
	(mL/kg)	(16.5)	(19.8)	(18.7)	(55.0)
Net I/O		**+160**	**+80**	**+140**	**+280**
Net since admission (9/12)		**+670**	**+800**	**+850**	**+2320**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Johnson, Sara, *Female, 42 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 2734* **Physician:** *T. Parker* **Admit Date:** *9/12*

Laboratory Results

	Ref. Range	9/12 1410	9/17 0600	9/18 0600
Chemistry				
Sodium (mEq/L)	136–145	145	136	138
Potassium (mEq/L)	3.5–5.1	4.9	3.9	4.1
Chloride (mEq/L)	98–107	106	103	104
Carbon dioxide (mEq/L)	23–29	27	23	23
BUN (mg/dL)	6–20	22 !↑	17	16
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.1	0.7	0.8
BUN/Crea ratio	10.0–20.0	15.5	24.3 !↑	20
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	3.8		
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	64	88	92
Glucose (mg/dL)	70–99	70	147 !↑	171 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	4.5	2.2	2.3
Magnesium (mg/dL)	1.5–2.4	2.2	1.6	1.5
Calcium (mg/dL)	8.6–10.2	9.1	9.1	9.4
Osmolality (mmol/kg/H_2O)	275–295	299 !↑	294	299 !↑
Bilirubin total (mg/dL)	≤1.2	0.4	0.8	0.6
Bilirubin, direct (mg/dL)	<0.3	0.2	0.1	0.2
Protein, total (g/dL)	6–7.8	7.5	6.5	7.0
Albumin (g/dL)	3.5–5.5	4.1	3.4 !↓	3.4 !↓
Prealbumin (mg/dL)	18–35	17 !↓	17 !↓	18 !↓
Ammonia (µg/L)	6–47	8	10	15
Alkaline phosphatase (U/L)	30–120	162 !↑	90	101
ALT (U/L)	4–36	41 !↑	23	33
AST (U/L)	0–35	50 !↑	23	30
CPK (U/L)	30–135 F 55–170 M	130	122	126
C-reactive protein (mg/dL)	<1.0	31 !↑	0.9	0.8
Lactate dehydrogenase (U/L)	208–378	310	270	278
Cholesterol (mg/dL)	<200	151		
HDL-C (mg/dL)	>50 F, >40 M	41 !↓		
VLDL (mg/dL)	7–32	11		

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Johnson, Sara, *Female, 42 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 2734* **Physician:** *T. Parker* **Admit Date:** *9/12*

Laboratory Results *(Continued)*

LDL (mg/dL)	0–99	110		
LDL/HDL ratio	<4.5	2.7		
Triglycerides (mg/dL)	<150	50		
Coagulation (Coag)				
PT (sec)	11–13	12.5	12.9	12.4
PTT (sec)	24–34	27	26	28
Hematology				
WBC ($\times 10^3/mm^3$)	3.9–10.7	11.7 !↑	10.4	10.5
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	5.1		
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	10.2 !↓		
Hematocrit (Hct, %)	37–47 F 41–51 M	30.6 !↓		
Mean cell volume (μm^3)	80–96	70 !↓		
Mean cell Hgb (pg)	28–32	25 !↓		
Mean cell Hgb content (g/dL)	32–36	28 !↓		
RBC distribution (%)	11.6–16.5	17.1 !↑		
Platelet count ($\times 10^3/mm^3$)	150–350	312		
Ferritin (ng/mL)	20–120 F 20–300 M	44		
Iron (µg/dL)	65–165 F 75–175 M	40 !↓		
Vitamin B_{12} (ng/dL)	24.4–100	32		
Methylmelonic acid (nmol/L)	0–378	437 !↑		
Folate (ng/dL)	5–25	20		
Zinc, serum (µg/mL)	0.60–1.2	1.2		
Vitamin D, 25 hydroxy (ng/mL)	30–100	19.7 !↓		
Free retinol (vitamin A; µg/dL)	20–80	15.7 !↓		
Ascorbic acid (mg/dL)	0.2–2.0	<0.1 !↓		
Selenium (ng/mL)	70–150	135		

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. What is inflammatory bowel disease? What does current medical literature indicate regarding its etiology?

2. Ms. Johnson was initially diagnosed with ulcerative colitis and then diagnosed with Crohn's. How could this happen? What are the similarities and differences between Crohn's disease and ulcerative colitis?

3. Ms. Johnson has been treated previously with prednisone and azathioprine. Her physician had planned to start infliximab prior to this admission. Explain the mechanism for each of these medications in the treatment of Crohn's disease. Identify any drug–nutrient interactions for each.

4. What laboratory values are consistent with an exacerbation of her Crohn's disease? Identify and explain these values.

5. During this admission, Ms. Johnson underwent an ileal resection and a complete colectomy with a permanent end ileostomy. The surgical report indicates that Ms. Johnson has 180 cm of small bowel to her end ileostomy. How long is the small intestine, and how significant is this resection? Does Ms. Johnson have SBS? Define SBS and provide a rationale for your answer.

6. What type of adaptation can the small intestine make after surgical resection? Do you think Ms. Johnson will be reliant on home parenteral nutrition (HPN) indefinitely?

7. List the medications that Ms. Johnson takes at home and the mechanism with which these medications can impact her ostomy output.

II. Understanding the Nutrition Therapy

8. What nutrients are normally digested and absorbed in the portion of the small intestine that has been resected?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

9. Do you expect the enterohepatic circulation of bile salts to be disrupted after this surgery? How might this impact the digestion and absorption of dietary fat?

10. In which area of the gastrointestinal tract are fluids primarily absorbed? Do you expect Ms. Johnson to experience dehydration in the postoperative phase? What nutrition therapies can the RDN implement to improve her hydration status?

11. What are the nutrition therapy recommendations for someone with an ileostomy? How does this differ from a patient with a colostomy?

III. Nutrition Assessment

12. Evaluate Ms. Johnson's %UBW and BMI.

13. Calculate Ms. Johnson's energy and protein requirements.

14. Identify any significant and/or abnormal laboratory measurements from both her hematology and chemistry labs. Explain possible mechanisms for the abnormal labs.

15. Evaluate Ms. Johnson's intake and output records. Are you concerned about her hydration status?

16. How will the RDN use the ostomy output to assess the absorption of Ms. Johnson's diet? What is the typical stool volume and consistency expected from an ileostomy?

IV. Nutrition Diagnosis

17. Select two nutrition problems and complete the PES statement for each.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

V. Nutrition Intervention

18. The surgeon notes Ms. Johnson probably will need bowel rest for at least 7–10 days. Using ASPEN guidelines, what would be the recommendation for nutrition support for Ms. Johnson?

19. The members of the nutrition support team note her serum phosphorus and serum magnesium are at the low end of the normal range. Why might that be of concern? How should the nutrition therapy be tailored to minimize electrolyte abnormalities?

20. Ms. Johnson was placed on PN support immediately postoperatively, and a nutrition support consult was ordered. Initially, she was prescribed to receive 305 g dextrose/day, 65 g amino acids/day, and 50 g lipid/day at goal rate. Her PN was initiated at 50 cc/hr with a goal rate of 104 cc/hr. Do you agree with the team's decision to initiate PN? Will this meet her estimated nutritional needs? Explain. From her PN, calculate pro (g) per kg, lipid (g) per kg, and total kcal.

21. For each of the PES statements you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).

VI. Nutrition Monitoring and Evaluation

22. What should the nutrition support team monitor daily while on PN? What should be monitored weekly? Explain your answers.

23. Would you make any changes to Ms. Johnson's prescribed nutrition support? Explain. What recommendations would you make to transition to enteral feeding?

24. Immediately after gastrointestinal surgery, there is an increased risk of diarrhea. What is the difference between secretory and osmotic diarrhea? Review her intake and output records—what evidence supports the presence of secretory and/or osmotic diarrhea?

25. Ms. Johnson's serum glucose increased to 171 mg/dL. Why do you think this level is now abnormal? What should be done about it?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

26. On post-op day 7 (9/19), Ms. Johnson's team notes she has had bowel sounds for the previous 48 hours with controlled ostomy output. The nutrition support team recommends consideration of an oral diet. Describe the dietary recommendations that are appropriate for Ms. Johnson. What would you monitor for tolerance? If successful, what recommendations would the RDN give to start weaning the PN?

27. What would be the primary nutrition concerns as Ms. Johnson prepares for intestinal rehabilitation after her discharge? Be sure to address her need for supplementation of any vitamins and minerals. Identify two nutritional outcomes with specific measures for evaluation.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics. Nutrition Care Manual. Inflammatory Bowel Disease. https://www.nutritioncaremanual.org/topic.cfm?ncm_toc_id=19449. Accessed February 14, 2020.

Aniwan S, Park SH, Loftus Jr. EV. Epidemiology, natural history, and risk stratification of Crohn's disease. *Gastroenterology*. 2017;46(3):463–480.

Bhardwaj S, Tandon P, Rivas JM, et al. Update on the management of intestinal failure. *Cleve Clin J Med*. 2016;83(11):841–848.

Buchman AL. Intestinal failure and rehabilitation. *Gastroenterol Clin North Am*. 2018;47(4):327–340.

Carroll RE, Benedetti E, Schowalter JP, Buchman AL. Management and complications of short bowel syndrome: An updated review. *Curr Gastroenterol Rep*. 2016;18(7):40.

Colia R, Corrado A, Cantatore FP. Rheumatologic and extra-intestinal manifestation of inflammatory bowel diseases. *Ann Med*. 2016;48(8):577–585.

Da Silva J, Seres D, Sabino K, et al. ASPEN consensus recommendations for refeeding syndrome. *Nutr in Clin Prac*. 2020;35(2):178–196

Durchschein F, Petritsch W, Hammer HF. Diet therapy for inflammatory bowel diseases: The established and the new. *World J Gastroenterol*. 2016;22:2179–2194.

Feuerstein JD et al. American gastroenterological association institute guideline on therapeutic drug monitoring in inflammatory bowel disease. *Gastroenterol*. 2017;153(3):827–834.

Ganji-Arjenaki M, Nasri H, Rafieian-Kopaei M. Nephrolithiasis as a common urinary system manifestation of inflammatory bowel diseases: A clinical review and meta-analysis. *J Nephropathol*. 2017;6(3):264–269.

Lee D, Albenberg L, Compher C, et al. Diet in the Pathogenesis and Treatment of Inflammatory Bowel Diseases. *Gastroenterology*. 2015;148(6):1087–1106. http://dx.doi.org/10.1053 /j.gastro.2015.01.007. Published May 2015. Accessed July 5, 2020.

McClave SA, Martindale RG, Vanek VW, et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Prenteral and Enteral Nutrition (A.S.P.E.N.). *JPEN J Parenter Enteral Nutr*. 2016;40(2):159–211.

Pironi L. Definitions of intestinal failure and the short bowel syndrome. *Best Pract Res Clin Gastroenterol*. 2016;30(2):173–185.

Sarbagili-Shabat C, Sigall-Boneh R, Levine A. Nutrition therapy in inflammatory bowel disease. *Curr Opin Gastroenterol*. 2015;31(4):303–308.

Seidner DL, Fujioka K, Boullata JI, Iyer K, Lee HM, Ziegler TR. Reduction of parenteral nutrition and hydration support and safety with long-term teduglutide treatment in patients with short bowel syndrome–associated intestinal failure: STEPS-3 study. *Nutr Clin Pract*. 2018;33(4):520–527.

Shivashankar R, Lewis JD. The role of diet in inflammatory bowel disease. *Curr Gastroenterol Rep*. 2017;19(5):22.

Svolos V, Hansen R, Nichols B, et al. Treatment of active Crohn's disease with an ordinary food-based diet that replicated exclusive enteral nutrition. *Gastroenterology*. 2019;156:1354–1367.

Wasilewski A, Zielinska M, Storr M, Fichna J. Beneficial effects of probiotics, prebiotics, symbiotics, and psychobiotics in inflammatory bowel disease. *Inflamm Bowel Dis*. 2015;21(7):1674–1682.

Yu YR, Rodriguez JR. Clinical presentation of Crohn's, ulcerative colitis, and indeterminate colitis: Symptoms, extra-intestinal manifestations, and disease phenotypes. *Semin Pediatr Surg*. 2017;26(6):349–355.

Zibdeh N. Crohn's Disease and Diet. eatright.org. https://www.eatright.org/health/wellness/digestive-health/crohns-disease-and-diet. Published September 11, 2019. Accessed January 30, 2020.

Internet Resources

Academy of Nutrition and Dietetics Nutrition Care Manual: http://www.nutritioncaremanual.org

Crohn's & Colitis Foundation of America: http://www.ccfa.org

Mayo Clinic: http://www.mayoclinic.org/diseases-conditions/crohns-disease/basics/definition/con-20032061

Medscape Gastroenterology. Advances in Inflammatory Bowel Disease (AIBD) 2019. Updated December 14, 2019. https://www.medscape.com/viewcollection/35168

National Digestive Diseases Information Clearinghouse (NDDIC): http://www.niddk.nih.gov/health-information/health-topics/digestive-diseases/crohns-disease/Pages/ez.aspx

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Five

NUTRITION THERAPY FOR HEPATOBILIARY AND PANCREATIC DISORDERS

The liver and pancreas are often called ancillary organs of digestion; however, the term *ancillary* does little to describe their importance in digestion, absorption, and metabolism of our macronutrients: carbohydrate, protein, and lipid. The cases in this section portray common conditions affecting these organs and outline their effects on nutritional status. The incidence of hepatobiliary disease has significantly increased over the last several decades, with cirrhosis being the most frequent diagnosis. The most common cause of cirrhosis is chronic alcohol ingestion; the second most common cause is viral hepatitis.

The incidence of malnutrition is very high in these disease states. Generalized symptoms of these diseases center around interruption of normal metabolism within these organs. Jaundice, anorexia, fatigue, abdominal pain, steatorrhea, and malabsorption are signs or symptoms of hepatobiliary disease. These symptoms may be responsive to nutrition therapy but also interfere with maintenance of an adequate nutritional status.

In Case 12, our patient is diagnosed with nonalcoholic fatty liver disease (NAFLD). The role of diet in etiology is a major focus of this case, and the role of the Mediterranean dietary pattern is explored as an intervention for treatment. This case also provides the opportunity to explore cultural food choices and their impact on nutrition interventions.

Case 13 focuses on the diagnosis of acute pancreatitis associated with chronic alcohol use. The use of nutrition support for acute pancreatitis has changed dramatically over the last decade, and this case allows for the application of evidenced-based guidelines when planning the care for this patient.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 12

Nonalcoholic Fatty Liver Disease (NAFLD)

Mr. Kim is a 53-year-old male who is at the outpatient gastroenterology clinic after referral from his primary care physician. Mr. Kim recently had a physical for his current job and his primary care physician noted an enlarged liver and elevated liver enzymes. Mr. Kim is subsequently diagnosed with nonalcoholic fatty liver disease (NAFLD); this diagnosis is confirmed by ultrasound and supported by the results of physical examination and biochemical tests.

Objectives

After completing this case, the student will be able to:

1. Describe the characteristics of NAFLD.
2. Explain the potential etiology of NAFLD and the current epidemiology.
3. Summarize the potential components of nutrition therapy used to treat NAFLD.
4. Analyze nutrition assessment data to evaluate nutritional status and identify specific nutrition problems.
5. Determine nutrition diagnoses and write appropriate PES statements.
6. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Kim, Myung, *Male, 53 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Clinic # 2252* **Physician:** *L. Reyes* **Appt Date:** *9/26*

leungchopan/Shutterstock.com

Patient Summary: 53-year-old male presented to outpatient gastroenterology clinic after being referred by his primary care physician. Mr. Kim had a physical for his current job and the primary care physician noted an enlarged liver and elevated liver enzymes. He is referred to Dr. Reyes for an evaluation.

History:

Onset of disease: Asymptomatic—hepatomegaly and elevated ALT, AST documented in physical 6 weeks ago.
Medical history: No significant medical history
Surgical history: No previous surgeries
Medications at home: None
Tobacco use: Yes
Alcohol use: Only occasionally
Family history: Mother—diabetes; Father—hypertension, CAD

Demographics:

Marital status: Married, 3 children
Years education: High school and 2 years at community college
Language: Korean/English
Occupation: Production supervisor—automotive manufacturer
Hours of work: 7 a.m.–3 p.m. or 3 p.m.–11 p.m.
Ethnicity: Korean
Religious affiliation: Methodist

Physical:

Chief complaint: "I recently had my physical for work—the doctor there said my liver was bigger than it should be and that there were changes in my blood tests."
General/Constitutional: Well-developed, well-nourished male. No acute distress.
HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: oral mucosa pink, dentition in good repair
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.
Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants. Firm liver, prominent left lobe + spleen tip. No ascites, masses, guarding, rebound, or CVA tenderness.
Extremities: Normal range of motion in all four extremities. No cyanosis or clubbing or peripheral edema.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Kim, Myung, *Male, 53 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Clinic # 2252* **Physician:** *L. Reyes* **Appt Date:** *9/26*

Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Skin is warm and dry. Patient is not diaphoretic. No rashes or ulcerations noted.
Psychiatric: Appropriate mood and affect for his clinical situation.

Vital Signs: Temp: 98.7°F Pulse: 77 Resp rate: 12
BP: 142/86 Height: 5'8" Weight: 205 lbs

Ultrasound Results (8/15):

Liver: The liver parenchyma has increased echogenicity with loss of internal architecture. There is no overt nodularity. There is no evidence of an intrahepatic mass or biliary ductal dilation. Doppler ultrasound demonstrates hepatopetal flow in the main portal vein. Flow velocity is 42 cm/sec, which is normal.
Biliary/Gallbladder: The gallbladder is normal without evidence of radiopaque stones. The biliary tree is nondilated.
Spleen: Spleen is enlarged, measuring 14.8 cm in craniocaudal dimension. No focal lesions.
Pancreas: Pancreas is normal. There is no evidence of pancreatic mass or peripancreatic fluid.
Impression: No overt morphological changes of cirrhosis. No focal mass lesions. Increased echogenicity of the liver likely reflects steatosis. Hepatosplenomegaly and hepatic steatosis.

Assessment and Plan:

Dx: Hepatosplenomegaly; hepatic steatosis—NAFLD. Hyperlipidemia and hyperglycemia noted.

Medical Tx plan: Repeat labs and ultrasound in six months. Referred to outpatient nutrition for weight loss and nutrition interventions for NAFLD. Explained in detail his diagnosis, potential complications, and steps to treat. Refer back to primary care MD for treatment of hyperlipidemia and hyperglycemia. F/U six months.

L. Reyes, MD

Nutrition:

General: Patient states his appetite is good and he has no problems chewing or swallowing. He reports no diarrhea or constipation. Patient reports that he likes all meats, rice, or noodles. Likes fruit. Eats whatever vegetables his wife cooks but does not choose these on his own. Says he has a "sweet tooth" and often will buy candy and cookies as his snacks between meals. He does not drink alcohol regularly but states that he will on special occasions or when he is watching soccer or football on TV. His meals do change if he is working a different shift; he is currently on days, which means he works 7:00 a.m.–3:00 p.m. When he works the afternoon shift, his big meal is in the middle of the day prior to going to work at 3:00 p.m.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Kim, Myung, *Male, 53 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Clinic # 2252* **Physician:** *L. Reyes* **Appt Date:** *9/26*

Usual dietary intake:

AM:	Coffee with sugar and milk
At work:	Doughnuts or some type of pastry from vending machines
Lunch:	Sub sandwich or burger, chips or fries, slice of pie or cookies from work cafeteria, soda
Dinner:	Wife prepares evening meal—meat such as Bulgogi, 1–2 c short-grain rice or noodles, vegetables, kimchi
Bedtime snack:	Chips, cookies, popcorn

Food allergies/intolerances/aversions: NKFA
Previous nutrition therapy? No
Food purchase/preparation: Wife
Vit/min intake: None

Laboratory Results

	Ref. Range	9/26 0600
Chemistry		
Sodium (mEq/L)	136–145	137
Potassium (mEq/L)	3.5–5.1	4.1
Chloride (mEq/L)	98–107	99
Carbon dioxide (mEq/L)	23–29	25
BUN (mg/dL)	6–20	13
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.05
BUN/Crea ratio	10.0–20.0	12
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.9
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	>60
Glucose (mg/dL)	70–99	121 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	3.8
Magnesium (mg/dL)	1.5–2.4	1.9
Calcium (mg/dL)	8.6–10.2	8.7
Osmolality (mmol/kg/H_2O)	275–295	285
Bilirubin total (mg/dL)	≤1.2	1.1
Bilirubin, direct (mg/dL)	<0.3	0.25
Protein, total (g/dL)	6–7.8	6.9

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Kim, Myung, *Male, 53 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Clinic # 2252* **Physician:** *L. Reyes* **Appt Date:** *9/26*

Laboratory Results *(Continued)*

Albumin (g/dL)	3.5–5.5	4.8
Prealbumin (mg/dL)	18–35	28
Ammonia (µg/L)	6–47	32
Alkaline phosphatase (U/L)	30–120	114
ALT (U/L)	4–36	54 !↑
AST (U/L)	0–35	42 !↑
CPK (U/L)	30–135 F 55–170 M	101
Lactate dehydrogenase (U/L)	208–378	302
Cholesterol (mg/dL)	<200	285 !↑
HDL-C (mg/dL)	>50 F, >40 M	43
VLDL (mg/dL)	7–32	70 !↑
LDL (mg/dL)	0–99	189 !↑
LDL/HDL ratio	<4.5	4.39
Triglycerides (mg/dL)	<150	350 !↑
T_4 (µg/dL)	5–12	10.1
T_3 (µg/dL)	75–98	82
HbA_{1C} (%)	<5.7	6.1 !↑
Coagulation (Coag)		
PT (sec)	11–13	11.9
INR	0.9–1.1	0.95
PTT (sec)	24–34	25
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	8.1
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	6.11
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	16.8
Hematocrit (Hct, %)	37–47 F 41–51 M	48

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Kim, Myung, *Male, 53 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Clinic # 2252* **Physician:** *L. Reyes* **Appt Date:** *9/26*

Laboratory Results *(Continued)*

Hematology, Manual Diff		
Neutrophil (%)	40–70	63.4
Lymphocyte (%)	22–44	27.1
Monocyte (%)	0–7	6.7
Eosinophil (%)	0–5	1.2
Basophil (%)	0–2	0.6
Blasts (%)	3–10	3
Urinalysis		
Collection method	—	Clean catch
Color	—	Yellow
Appearance	—	Cear
Specific gravity	1.001–1.035	1.004
pH	5–7	6.1
Protein (mg/dL)	Neg	Neg
Glucose (mg/dL)	Neg	Neg
Ketones	Neg	Neg
Blood	Neg	Neg
Bilirubin	Neg	Neg
Nitrites	Neg	Neg
Urobilinogen (EU/dL)	<1.0	0.1
Leukocyte esterase	Neg	Neg
Prot chk	Neg	Neg
WBCs (/HPF)	0–5	0
RBCs (/HPF)	0–2	0
Bact	0	0
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. Define *nonalcoholic fatty liver disease* and *nonalcoholic steatohepatitis*.

2. What is/are the potential etiology(ies) of nonalcoholic fatty liver disease (NAFLD)? Does the research indicate that there are any genetic contributions to this condition?

3. Concerning the epidemiology of this condition, are individuals of specific ethnicities or of either gender at higher risk for the development of NAFLD?

4. How is this condition typically diagnosed? Are there common presenting signs and symptoms for NAFLD? How might the markers of metabolic syndrome be related to NAFLD?

5. Explain the potential role of diet in the development of NAFLD. Specifically address the roles of simple sugars, fructose, refined carbohydrates, and saturated fat.

6. What are the long-term consequences of NAFLD if the condition progresses?

II. Understanding the Nutrition Therapy

7. Explain the rationale for prescribing a low-carbohydrate diet in the treatment of NAFLD.

8. Describe the Mediterranean diet. How does this eating pattern support the nutritional goals of treatment for NAFLD?

9. Is there a role for supplementation of antioxidants in the treatment of individuals with NAFLD?

10. Mr. Kim asks you about an article he recently read about the benefits of coffee consumption in fatty liver disease. What recommendations might you give him?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

III. Nutrition Assessment

11. Evaluate Mr. Kim's weight status.

12. Calculate Mr. Kim's energy and protein requirements for weight maintenance and for weight loss.

13. What other anthropometric measurements, if any, may be helpful in fully assessing Mr. Kim's nutritional status and disease risk?

14. Identify any significant and/or abnormal laboratory measurements for Mr. Kim. Explain possible mechanisms for the abnormal labs.

15. Assess Mr. Kim's typical diet for total energy intake and % carbohydrate, protein, and fat. How does his estimated energy intake compare to his recommended requirements for weight loss that you calculated in question 12? Identify the most important factors that may impact his NAFLD.

16. How will you assess Mr. Kim's physical activity level? List three questions that you would use in your interview to support your understanding of his daily and recreational activity.

IV. Nutrition Diagnosis

17. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

18. What culturally appropriate nutrition therapy recommendations will you make for Mr. Kim?

19. Identify the nutrition education materials and tools you may use in your nutrition education.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

20. What steps might you use to assess Mr. Kim's readiness for dietary and behavior change?

21. Are there Korean traditional health practices that you would want to address?

22. Does Mr. Kim meet the criteria for metabolic syndrome? Explain how the nutrition interventions for NAFLD will help with the components of this condition.

VI. Nutrition Monitoring and Evaluation

23. What topics might you want to address with Mr. Kim in follow-up nutrition appointments?

24. What outcomes will you monitor to evaluate the effectiveness of your nutrition intervention?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Alwahsh SM, Gebhardt R. Dietary fructose as a risk factor for non-alcoholic fatty liver disease (NAFLD). *Arch Toxicol*. 2017;91:1545–1563.

Bedossa P. Pathology of non-alcoholic fatty liver disease. *Liver International.* 2017;37(Suppl 1):85–89.

Berlanga A, Guiu-Jurado E, Porras JA, Auguet T. Molecular pathways in non-alcoholic fatty liver disease. *Clin Exp Gastroenterol*. 2014;7:221–239.

Bettermann K, Hohensee T, Haybaeck J. Steatosis and steatohepatitis: Complex disorders. *Int J Mol Sci*. 2014;15: 9924–9944.

Chalasani N, Younossi Z, Lavine JE, et al. The diagnosis and management of non-alcoholic fatty liver disease: Practice guideline from the American Association for the Study of Liver Diseases. Hepatology. 2018;67: 328–350.

Chiu S, Sievenpiper JL, de Souza RJ, et al. Effect of fructose on markers of non-alcoholic fatty liver disease (NAFLD): A systematic review and meta-analysis of controlled feeding trials. *Eur J Clin Nutr*. 2014;68:416–423.

Chung GE, Youn J, Kim YS, et al. Dietary patterns are associated with the prevalence of nonalcoholic fatty liver disease in Korean adults. *Nutrition.* 2019;62:32–38.

Dongiovanni P, Anstee Q, Valenti L. Genetic predisposition in NAFLD and NASH: Impact on severity of liver disease and response to treatment. *Curr Pham Des*. 2013;19:5219–5238.

Gelli C, Tarocchi M, Abenavoli L, et al. Effect of a counseling-supported treatment with the Mediterranean diet and physical activity on the severity of non-alcoholic fatty liver disease. *World J Gastroenterol.* 2017;23:3150–3162.

George ES, Forsyth A, Itsiopoulos C, et al. Practical dietary recommendations for the prevention and management of nonalcoholic fatty liver disease in adults. *Adv Nutr*. 2018;9:30–40.

Golabi P, Paik J, Reddy R, et al. Prevalence and long-term outcomes of non-alcoholic fatty liver disease among elderly individuals from the United States. *BMC Gastroenterol*. 2019;19:56. https://doi.org/10.1186/s12876-019-0972-6. Accessed July 5, 2020.

Hashemi Kani A, Alavian S, Haghighatdoost F, Azadbakht L. Diet macronutrients composition in nonalcoholic fatty liver disease: A review on the related documents. *Hepat Mon*. 2014;14:e10939.

Kabbany MN, Selvakunnar PK, Watt K, et al. Prevalence of nonalcoholic steatohepatitis-associated cirrhosis in the United States: An analysis of national health and nutrition examination. *Am J Gastroenterol.* 2017;112:581–587.

Kim NH, Kim YJ, Yoo HJ, et al. Clinical and metabolic factors associated with development and regression of nonalcoholic fatty liver disease in nonobese subjects. *Liver Intl*. 2014;34:604–611.

Kontogianni MD, Tileli N, Margariti A, et al. Adherence to the Mediterranean diet is associated with the severity of non-alcoholic fatty liver disease. *Clin Nutr*. 2014;33:678–683.

Le MH, Devaki P, Ha NB, et al. Prevalence of non-alcoholic fatty liver disease and risk factors for advanced fibrosis and mortality in the United States. *PLOS One.* 2017;12:e0173499.

Mock K, Laateef S, Benedito V, Tou JC. High-fructose corn syrup-55 consumption alters hepatic lipid metabolism and promotes triglyceride accumulation. *J Nutr Biochem.* 2017;39:32–39.

Nahikian-Nelms ML. Nutrition assessment: Foundation of the nutrition care process. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:38–75.

Nahikian-Nelms M, Sucher K. Diseases of the liver, gallbladder, and exocrine pancreas. In Nelms MN, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning: 2019:435–476.

Suarez M, Boque N, del Bas JM, et al. Mediterranean diet and multi-ingredient–based interventions for the management of non-alcoholic fatty liver disease. *Nutrients.* 2017;9:1052–1083.

ter Horst KW, Serlie MJ. Fructose consumption, lipogenesis, and non-alcoholic fatty liver disease. *Nutrients.* 2017;9:981–1002.

Ullah R, Rauf N, Nabi G, et al. Role of nutrition in the pathogenesis and prevention of non-alcoholic fatty liver disease: Recent updates. *In J Biol Sci*. 2019;15:265–276.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015–2020 Dietary Guidelines for Americans. 8th ed. 2015. http://health.gov/dietaryguidelines/2015/guidelines/. Accessed February 17, 2020.

Younossi ZM. The epidemiology of non-alcoholic steatohepatitis. *Clin Liver Dis*. 2018;11:92–94.

Internet Resources

Academy of Nutrition and Dietetics Nutrition Care Manual: http://www.nutritioncaremanual.org

American College of Gastroenterology: Non-alcoholic Fatty Liver Disease (NAFLD): http://patients.gi.org/topics/fatty-liver-disease-nafld/

American Liver Foundation: NAFLD: http://www.liverfoundation.org/abouttheliver/info/nafld/

National Institute of Diabetes and Digestive and Kidney Diseases: Nonalcoholic Steatohepatitis: http://www.niddk.nih.gov/health-information/health-topics/liver-disease/nonalcoholic-steatohepatitis/Pages/facts.aspx

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 13

Acute Pancreatitis

Mr. Mahon is a 29-year-old doctoral student who has been suffering from nausea, vomiting, and acute abdominal pain for several days. He is now admitted after a worsening of symptoms with a diagnosis of acute pancreatitis, which is most likely related to chronic alcohol intake.

Objectives

After completing this case, the student will be able to:

1. Understand the physiological role of the pancreas.
2. Determine the etiology of acute versus chronic pancreatitis.
3. Evaluate the signs and symptoms consistent with pancreatitis.
4. Evaluate the current literature regarding nutrition support for acute pancreatitis.
5. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses for this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mahon, Jon, *Male, 29 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed 5* **Physician:** *C. Conrad* **Admit Date:** *4/21*

iStock.com/Aleksandar Georgiev

Patient Summary: Patient is a 29-year-old male who presented to the ED 48 hours ago with increasing abdominal pain. Patient returned to the ED when abdominal pain continued to get worse and is now admitted to MICU.

History:
Onset of disease: Patient is a doctoral student who began experiencing acute abdominal pain, N, V several days ago. Assumed it was a viral illness but when symptoms continued, he was brought to the ED by neighbor and friend. When questioned about alcohol intake, patient states that, yes, he does drink alcohol. States he was trying to stop his antidepressant medications and guesses he steadily increased his alcohol intake.
Medical history: Depression
Surgical history: s/p appendectomy age 12
Medications at home: None
Tobacco use: None
Alcohol use: Six pack beer, 4–5 "shots" bourbon daily; weekends: beer, bourbon, wine, and other mixed drinks
Family history: Mother—breast cancer; father—hypertension

Demographics:
Marital status: Single
Years education: 16+
Language: English only
Occupation: PhD student in computer science
Hours of work: In school full-time; works as research assistant in department
Household members: Lives with roommate
Ethnicity: Caucasian
Religious affiliation: Jewish

Admitting History/Physical:
Chief complaint: "My stomach pain is so intense—I just can't stand it. I can't seem to quit vomiting and cannot keep anything down. It has been going on for several days and I thought I just had the flu or something, but it just hasn't stopped."

General: Pale, obese male in obvious distress

Vital Signs:

Temp: 101.7°F	Pulse: 108	Resp rate: 27
BP: 132/96	Height: 5'11"	Weight: 245 lbs

HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: oral mucosa pink, dry mucous membranes, dentition in good repair
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mahon, Jon, *Male, 29 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed 5* **Physician:** *C. Conrad* **Admit Date:** *4/21*

Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Respirations rapid but lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, extreme tenderness, with hypoactive bowel sounds in all four quadrants. Guarding and rebound.
Extremities: Normal range of motion in all four extremities. No cyanosis or clubbing or peripheral edema.
Neurological: Conscious, alert and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Skin is clammy. Patient is diaphoretic. No rashes or ulcerations noted.
Psychiatric: Appropriate mood and affect for acute clinical situation.

Nursing Assessment	**4/22**
Abdominal appearance (concave, flat, rounded, obese, distended)	obese
Palpation of abdomen (soft, rigid, firm, masses, tense)	tense
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P, hypo
LUQ	P, hypo
RLQ	P, hypo
LLQ	P, hypo
Stool color	none
Stool consistency	
Tubes/ostomies	NA
Genitourinary	
Urinary continence	catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	cloudy, amber
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD1=cold, M=moist, H=hot)	W
Skin turgor (good, fair, poor, TENT=tenting)	TENT
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact, D

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mahon, Jon, *Male, 29 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed 5* **Physician:** *C. Conrad* **Admit Date:** *4/21*

Nursing Assessment *(Continued)*

Nursing Assessment	4/22
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact, D
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	19

Admission Orders:

Laboratory: CBC, CMP, Amylase, Lipase, and Mg
Repeat CBC, Amylase, Lipase in 12 hrs
Repeat Chem 7 every 6 hrs

Radiology:
Abdominal series: pancreatitis, rule out small bowel obstruction
CT abdomen/pelvis: pancreatitis, rule out pseudo cyst
Abdominal U/S: pancreatitis, rule out pseudo cyst, biliary tract disease

Vital Signs: Every 4 hrs
I & O recorded every 8 hrs
NG tube to low intermittent suction (if persistent vomiting, obstruction, severe ileus)
Notify MD for fever >101, WBC >16,000, Calcium <8 mg/dL, unstable vital signs, or worsening condition

Diet: NPO

Activity: Bed rest

IVF: D_5W 40 MEq KCl 125 mL/hr

Scheduled Medications:
Imipenem 1000 mg every 6 hrs
Famotidine 20 mg IVP every 12 hrs
Meperidine 50–150 mg IV every 3 hrs prn
Ondansetron 2–4 mg IV every 4–6 hrs prn
Docusate sodium 100 mg po two times daily prn, if no bowel movement
Magnesium hydroxide 30 mL po daily prn
Lorazepam 0.5–1 mg po every 8 hrs prn

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mahon, Jon, *Male, 29 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed 5* **Physician:** *C. Conrad* **Admit Date:** *4/21*

Nutrition:

Meal type: NPO
Fluid requirement: 1900–2400 mL
History: Patient states that he has gained weight over the last 5 years—almost 50 lbs. Some of his weight gain may be due to his schedule in graduate school and that he no longer is exercising. Usually eats out for dinner—drinks coffee at breakfast with a bagel or toast—lunch is usually a sub sandwich or pizza. Patient states that he has eaten very little over the past 3 days because of pain, nausea, and vomiting. When questioned about alcohol intake, patient states that he didn't realize how much he had been drinking but that he was trying to stop his antidepressant medications and guesses he increased his alcohol intake.

Intake/Output

Date		**4/21 0701–4/22 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**0**	**0**	**0**	**0**
	I.V.	**1,000**	**1,000**	**1,000**	**3,000**
	(mL/kg/hr)	(1.12)	(1.12)	(1.12)	(1.12)
	I.V. piggyback	**500**	**500**	**500**	**1,500**
	PN				
	Total intake (mL/kg)	**1,500** (13.5)	**1,500** (13.5)	**1,500** (13.5)	**4,500** (40.4)
OUT	Urine	**1,312**	**1,410**	**1,622**	**4,344**
	(mL/kg/hr)	(1.47)	(1.58)	(1.82)	(1.63)
	Emesis output				
	Other: NG tube to suction	**100**	**120**	**115**	**335**
	Stool	**200**	**0**	**0**	**200**
	Total output (mL/kg)	**1,612** (14.5)	**1,530** (13.7)	**1,737** (15.6)	**4,879** (43.8)
Net I/O		**–112**	**–30**	**–237**	**–379**
Net since admission (4/21)		**–112**	**–142**	**–379**	**–379**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mahon, Jon, *Male, 29 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed 5* **Physician:** *C. Conrad* **Admit Date:** *4/21*

MD Progress Note:
4/22 0840

Subjective: Jon Mahon's previous 24 hours reviewed
Vitals: Temp: 101.5°F, Pulse: 82, Resp rate: 25, BP: 122/78
Urine Output: 4344 mL (39 mL/kg)

Physical Exam
*General:*Well-developed, alert, and oriented to person, place, and time. Continues with acute abdominal pain. APACHE Score 4.
HEENT: WNL
Cardiac: WNL
Pulmonary: Clear to auscultation
Abdominal: Hypoactive bowel sounds, abdominal tenderness, rebound, guarding, N, V
Assessment: Results from abdominal ultrasound: inflammation, peripancreatic stranding, and fluid collection. Elevated lipase, amylase, and CRP.

Dx: Acute Pancreatitis

Plan: Continue D5W 40 MEq KCl 125 mL/hr with current medications. Monitor urine output to ensure >40 mL/kg. Nutrition consult for nutrition support recommendations.

..... C. Conrad, MD

Laboratory Results

	Ref. Range	11/29 1522
Chemistry		
Sodium (mEq/L)	136–145	138
Potassium (mEq/L)	3.5–5.1	3.5
Chloride (mEq/L)	98–107	98
Carbon dioxide (mEq/L)	23–29	29
Bicarbonate (mEq/L)	23–28	24
BUN (mg/dL)	6–20	30 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.6 !↑
BUN/Crea ratio	10.0–20.0	18
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.2

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mahon, Jon, *Male, 29 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed 5* **Physician:** *C. Conrad* **Admit Date:** *4/21*

Laboratory Results *(Continued)*

Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	101
Glucose (mg/dL)	70–99	142 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	3.4
Magnesium (mg/dL)	1.5–2.4	1.9
Calcium (mg/dL)	8.6–10.2	10.2
Anion gap (mmol/L)	10–20	18
Osmolality (mmol/kg/H_2O)	275–295	294.6
Bilirubin total (mg/dL)	≤1.2	1.9 !↑
Bilirubin, direct (mg/dL)	<0.3	0.9 !↑
Protein, total (g/dL)	6–7.8	6.8
Albumin (g/dL)	3.5–5.5	3.3 !↓
Prealbumin (mg/dL)	18–35	22
Ammonia (µg/L)	6–47	25
Alkaline phosphatase (U/L)	30–120	256 !↑
ALT (U/L)	4–36	42 !↑
AST (U/L)	0–35	56 !↑
CPK (U/L)	30–135 F 55–170 M	219 !↑
Lactate dehydrogenase (U/L)	208–378	402 !↑
Lipase (U/L)	0–110	980 !↑
Amylase (U/L)	25–125	543 !↑
CRP (mg/dL)	<1	141 !↑
Cholesterol (mg/dL)	<200	210 !↑
HDL-C (mg/dL)	>50 F, >40 M	54
VLDL (mg/dL)	7–32	29
LDL (mg/dL)	0–99	127 ↑
LDL/HDL ratio	<4.5	2.35
Triglycerides (mg/dL)	<150	585 !↑
HbA_{1C} (%)	<5.7	5.3

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mahon, Jon, *Male, 29 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed 5* **Physician:** *C. Conrad* **Admit Date:** *4/21*

Laboratory Results *(Continued)*

Coagulation (Coag)		
PT (sec)	11–13	13
INR	0.9–1.1	0.97
PTT (sec)	24–34	27
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	19.8 !↑
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	5.2
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	15.8
Hematocrit (Hct, %)	37–47 F 41–51 M	49
Hematology, Manual Diff		
Neutrophil (%)	40–70	90 !↑
Lymphocyte (%)	22–44	32
Monocyte (%)	0–7	5
Eosinophil (%)	0–5	1
Basophil (%)	0–2	2
Blasts (%)	3–10	3
Segs (%)	0–60	74 !↑
Bands (%)	0–10	16 !↑
Urinalysis		
Collection method	—	Cath
Color	—	Dark, amber
Appearance	—	Cloudy
Specific gravity	1.001–1.035	1.029
pH	5–7	5.1
Protein (mg/dL)	Neg	+ !↑
Glucose (mg/dL)	Neg	Neg
Ketones	Neg	+ !↑
Blood	Neg	Neg
Bilirubin	Neg	+ !↑

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mahon, Jon, *Male, 29 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed 5* **Physician:** *C. Conrad* **Admit Date:** *4/21*

Laboratory Results *(Continued)*

Nitrites	Neg	Neg
Urobilinogen (EU/dL)	<1.0	1.2 !↑
Leukocyte esterase	Neg	Neg
Prot chk	Neg	+ !↑
WBCs (/HPF)	0–5	2
RBCs (/HPF)	0–2	0
Bact	0	0
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0
Arterial Blood Gases (ABGs)		
pH	7.35–7.45	7.40
pCO_2 (mm Hg)	35–45	40
SO_2 (%)	≥95	97
CO_2 content (mmol/L)	25–30	29
O_2 content (%)	15–22	18
pO_2 (mm Hg)	≥80	95
HCO_3^- (mEq/L)	21–28	24

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. Describe the normal exocrine and endocrine functions of the pancreas.

2. Determine the potential etiology of both acute and chronic pancreatitis. What information provided in the physical assessment supports the diagnosis of acute pancreatitis?

3. What laboratory values or other tests support this diagnosis? List all abnormal values and explain the likely cause for each abnormal value.

4. The physician lists an APACHE score in his note. What factors are used to determine this score? What does this mean? Ranson's Criteria and the Atlanta Criteria are also used to determine the severity of pancreatitis. Define each of these sets of criteria.

5. What are the potential complications of acute pancreatitis?

II. Understanding the Nutrition Therapy

6. Historically, the patient with acute pancreatitis was made NPO. Why?

7. The physician has written an order for a nutrition consult. Using the most current literature and ASPEN guidelines, explain the role of enteral feeding in acute pancreatitis. Do you agree with the initiation of enteral feeding? Why or why not?

8. If you have recommended enteral feeding, does this patient's case indicate the use of an immune-modulating formula?

III. Nutrition Assessment

9. Assess Mr. Mahon's height and weight. Calculate his BMI and % usual body weight.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

10. Evaluate Mr. Mahon's initial nursing assessment. What important factors noted in his nutrition assessment will affect your nutrition recommendations?

11. Determine Mr. Mahon's energy and protein requirements. Explain the rationale for the method you used to calculate these requirements.

12. Determine Mr. Mahon's fluid requirements. Compare this with the information on the intake/output record.

13. From the nutrition history, assess Mr. Mahon's alcohol intake. What is his average caloric intake from alcohol each day using the information that he provided to you?

14. List all medications that Mr. Mahon is receiving. Determine the action of each medication and identify any drug–nutrient interactions that you should monitor.

IV. Nutrition Diagnosis

15. Identify the pertinent nutrition problems.

16. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

17. Determine your enteral feeding recommendations for Mr. Mahon. Provide a formula choice, goal rate, and instructions for initiation and advancement.

18. What recommendations can you make to the patient's critical care team to help improve tolerance to the enteral feeding?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

VI. Nutrition Monitoring and Evaluation

19. List factors that you would monitor to assess tolerance and adequacy of nutrition support.

20. If this patient's acute pancreatitis resolves, what will be the recommendations for him regarding nutrition and his alcohol intake when he is discharged?

21. Write an ADIME note that provides your initial nutrition assessment and enteral feeding recommendations.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Al-Omran M, AlBalawi ZH, Tashkandi MF, et al. Enteral versus parenteral nutrition for acute pancreatitis (review). *Cochrane Database Syst Rev*. 2010;CD002837.

Bakker OJ, van Brunschot S, Farre A, et al. Timing of enteral nutrition in acute pancreatitis: Meta-analysis of individuals using a single-arm of randomized trials. *Pancreatology*. 2014;14:340–346.

Bankhead R, Boullata J, Brantley S, et al. Enteral nutrition practice recommendations. *JPEN J Parenter Enteral Nutr*. 2009;33:122–167.

Banks PA, Bollen TL, Dervenis C, et al. Classification of acute pancreatitis—2012: Revision of the Atlanta classification and definitions by international consensus. *Gut*. 2013;62:102–111.

Conwell DL, Banks PA, Greenberger NJ. Acute and Chronic Pancreatitis. In Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J. eds. *Harrison's Principles of Internal Medicine,* 20th ed. New York, NY: McGraw-Hill; 2018. htpp://accessmedicine.mhmedical/com/content.aspx?bookid=2129&sectionid=192284191. Accessed February 17, 2020.

Crockett SD, Wani S, Gardner TB, et al. American Gastroenterological Association Institute Guideline for the initial management of acute pancreatitis. *Gastroenterology.* 2018;154:1096–1101.

Krenitsky J, Makola D, Parrish CR. Pancreatitis part II—Revenge of the cyst: A practical guide to jejunal feeding. *Pract Gastroenterol.* 2007;31:54.

Krenitsky J, Makola D, Parrish CR. Parenteral nutrition in pancreatitis is passé: But are we ready for gastric feeding? *Pract Gastroenterol*. 2007;31:92.

Krishna SG, Kamboj AK, Hart PA, Hinton A, Conwell DL. The changing epidemiology of acute pancreatitis hospitalizations. *Pancreas.* 2017;46:482–488.

Lee PJ, Papachristou GI. New insights into acute pancreatitis. *Nat Rev Gastroenterol Hepatol.* 2019;16:479–496.

McClave SA, Martindale RG, Vanek VW, et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). *JPEN J Parenter Enteral Nutr.* 2016;40(2):159–211

Meier R. Enteral fish oil in acute pancreatitis. *Clin Nutr.* 2005;24(2):169–171.

Mirtallo J, et al. for the International Consensus Guideline Committee for Pancreatitis Task Force. International consensus guidelines for nutrition therapy in pancreatitis. *J Parenter Enteral Nutr*. 2012;36:284–291.

Moraes JM, Felga GE, Chebli LA, et al. A full solid diet as the initial meal in mild acute pancreatitis is safe and results in a shorter length of hospitalization. *J Clin Gastroenterol*. Jan 5, 2010;44(7):517–522.

Nahikian-Nelms ML. Metabolic stress and the critically ill. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:674–700.

Nahikian-Nelms ML. Nutrition assessment: Foundation of the nutrition care process. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:38–75.

Nahikian-Nelms M, Sucher K. Diseases of the liver, gallbladder, and exocrine pancreas. In Nelms MN, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:435–476.

Nally DM, Kelly EG, Clarke M, Ridgway P. Nasogastric nutrition is efficacious in severe acute pancreatitis: A systematic review and meta-analysis. *Br J Nutr*. 2014;112:1769–1778.

Rajkumar N, Karthikeyan VS, Ali SM, Sistia SC, Kate V. Clear liquid diet vs soft diet as the initial meal in patients with mild acute pancreatitis: A randomized interventional trial. *Nutr Clin Pract*. 2013;28:365–370.

Roberts K, Nahikian-Nelms M, Ukelja A, Lara LF. Nutritional aspects of acute pancreatitis. *Gastroenterol Clin North Am*. 2018;47:77–94.

Sathiaraj E, Murthy S, Mansard MJ, Rao GV, Mahukar S, Reddy DN. Clinical trial: Oral feeding with a soft diet compared with clear liquid diet as initial meal in mild acute pancreatitis. *Aliment Pharmacol Ther*. 2008;28:777–781.

Sucher K, Mattfeldt-Beman M. Diseases of the liver, gallbladder and exocrine pancreas. In Nahikian-Nelms M, Sucher K, Lacey K, Roth S. *Nutrition Therapy and Pathophysiology*. 3rd ed. Belmont, CA: Cengage Learning; 2016:436–468.

Tenner S, Baillie J, DeWitt J, Vege SS. American College of Gastroenterology guideline: Management of acute pancreatitis. *Am J Gastroenterol*. 2013;108:1400–1416.

Thomson A. Enteral versus parenteral nutritional support in acute pancreatitis: A clinical review. *J Gastroenterol Hepatol*. 2006;21:22–25.

Uomo G. Pancreatic rest or not? The debate on the nutrition in acute pancreatitis continues. *J Pancreas*. 2013;14:216–217.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Internet Resources

AND Evidence Analysis Library: http://www.andeal.org/
American Gastroenterology Association: http://www.gastro.org/patient-care/conditions-diseases/pancreatitis
Cleveland Clinic: http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/gastroenterology/acute-pancreatitis/Default.htm
Drug Bank: http://www.drugbank.ca/drugs/
National Pancreatitis Foundation: http://www.pancreasfoundation.org/patient-information/acute-pancreatitis/
National Institute of Diabetes and Digestive and Kidney Diseases: http://www.niddk.nih.gov/health-information/health-topics/digestive-diseases/pancreatitis/Pages/facts.aspx
Nutrition Care Manual: http://www.nutritioncaremanual.org

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Six

NUTRITION THERAPY FOR ENDOCRINE DISORDERS

The most common of all endocrine disorders is diabetes mellitus, currently an incurable chronic disease. Diabetes mellitus is actually a group of diseases characterized by hyperglycemia resulting from cessation of insulin production, impairment in insulin secretion, and/or impairment in insulin action. Type 1 and Type 2 diabetes are the major classifications for this disorder. The three cases in this section provide examples of patients at all stages of treatment and diagnosis. Case 14 focuses on newly diagnosed type 1 diabetes with a more typical presentation in a pediatric patient. Case 15 focuses on a newly diagnosed Type 2 diabetes mellitus in a minority population. Case 16 addresses Type 2 diabetes mellitus in the adult who is required to transition to insulin therapy.

Diabetes mellitus is a serious public health problem in the United States. New diagnoses of diabetes have more than tripled in the last 20 years. In 2018, this chronic disease was known to affect 26.9 million Americans (available from: https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf).

Diabetes affects men and women equally, and the prevalence is highest among American Indians/Alaska Natives, individuals of Hispanic origin and non-Hispanic Blacks. In addition, diabetes is one of the most costly health problems in the United States. In 2017, health care and other direct medical costs combined with indirect costs (such as loss of productivity) totaled approximately $327 billion (available from: https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf). Diabetes is the seventh leading cause of death in the United States. In 2017 more than 270,000 people died as a result of diabetes and its complications. Diabetes is also the leading cause of both new-onset blindness and kidney failure requiring dialysis or organ transplant for survival in the United States.

Medical nutrition therapy is integral to total diabetes care and management. The Diabetes Control and Complications Trial (DCCT) corroborated the significance of integrating nutrition and blood glucose self-management education in achieving and maintaining target blood glucose levels. Nutrition and meal planning are among the most challenging aspects of diabetes care for the person with diabetes and for the health care team. The major components of successful nutrition management are learning about nutrition therapy, altering eating habits, implementing new behaviors, participating in physical activity, evaluating those interventions, and integrating this information into overall diabetes care. Observance of meal-planning principles requires individuals with diabetes to make demanding lifestyle changes. To be effective, the registered dietitian must be able to customize his or her approach to the personal lifestyle and diabetes management goals of the individual with diabetes. Cases 14–16 allow you to put these guidelines into practice.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 14

Pediatric Type 1 Diabetes Mellitus

Emma Mason is a 10-year-old 5th grader previously in good health who is admitted through the ED with a new diagnosis of acute hyperglycemia—R/O diabetes mellitus.

Objectives

After completing this case, the student will be able to:

1. Describe the pathophysiology of type 1 diabetes mellitus.
2. Interpret laboratory parameters to assess fluid, electrolyte, and acid-base balance.
3. Integrate an insulin regimen with nutrition therapy and provide appropriate recommendations for carbohydrate-to-insulin ratios and correction dosages.
4. Prioritize teaching and educational requirements for a child and family with newly diagnosed type 1 diabetes.
5. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses for this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mason, Emma, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 744* **Physician:** *M. Cho* **Admit Date:** *5/3*

iStock.com/loco75

Patient Summary: Emma Mason is a 10-year-old female admitted with acute-onset hyperglycemia.

History:

Onset of disease: Patient presented to ED after fainting at softball practice. During ED assessment, patient was noted to have serum glucose of 724 mg/dL.
Medical history: None—recently had strep throat
Surgical history: None
Medications at home: None
Tobacco use: Nonsmoker
Alcohol use: None
Family history: Father—HTN; mother—hyperthyroidism; sister—celiac disease

Demographics:

Marital status: N/A (5th-grade female)
Years education: 5 years
Language: English only
Occupation: Student
Hours of work: N/A
Household members: Mother, father, sister age 8, and brother age 4
Ethnicity: Caucasian
Religious affiliation: Lutheran

Admitting History/Physical:

Chief complaint: "I had strep throat a few days ago. I felt like I was well enough to go to softball practice today but after playing about 15 minutes, I just felt horrible. I sat down and they tell me I fainted. . . . I have been really thirsty—thirstier than I have ever been in my whole life and then I have had to use the bathroom a lot. . . . I even have to get up at night to go to the bathroom."
General appearance: Slim, distressed, 10-year-old female

Vital Signs:

Temp: 98.6°F	Pulse: 101	Resp rate: 22
BP: 122/77	Height: 53"	Weight: 69 lbs (weight at appointment 7 days previous: 71 lbs; weight 3 months previous: 82 lbs)

Heart: Regular rate and rhythm
HEENT: Head: WNL
Eyes: PERRLA
Ears: clear
Nose: clear
Throat: dry mucous membranes without exudates or lesions

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mason, Emma, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 744* **Physician:** *M. Cho* **Admit Date:** *5/3*

Genitalia: Deferred
Neurologic: Alert but slightly confused. Glasgow Coma Scale: 15.
Extremities: Noncontributory
Skin: Cool, clammy
Chest/lungs: Respirations are rapid—clear to auscultation and percussion
Peripheral vascular: Pulse 41 bilaterally, no edema
Abdomen: Active bowel sounds ×4; tender, nondistended

Orders:

1. Regular insulin 1 unit/mL NS 40 mEq KCl/liter @ 108 mL/hr. Begin infusion at 0.1 unit/kg/hr = 3.7 units/hr. Begin dextrose when glucose is <300 mg/dL or decrease in POC glucose >100 mg/dL per hour.

2. Labs: BMP Stat
   Phos Stat
   Calcium Stat
   UA with culture if indicated Stat Clean catch
   Bedside glucose Stat
   Bedside I-Stat: EG7 Stat
   GAD 65
   IA-2
   Thyroid peroxidase antibodies
   TSH
   Comp metabolic panel (CMP)
   Thyroglobulin antibodies
   C-peptide
   Hemoglobin A1c
   TTG-IgA

3. NPO except for ice chips and medications. After 12 hours, clear liquids if stable. Then, advance to consistent carbohydrate diet order.

4. Consult diabetes education team for self-management training for patient and parents to begin education after stabilized.

Nursing Assessment	**5/4**
Abdominal appearance (concave, flat, rounded, obese, distended)	flat
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mason, Emma, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 744* **Physician:** *M. Cho* **Admit Date:** *5/3*

Nursing Assessment *(Continued)*

Nursing Assessment	5/4
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	light brown
Stool consistency	soft
Tubes/ostomies	NA
Genitourinary	
Urinary continence	yes
Urine source	clean specimen
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	cloudy, amber
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	DI, CLM
Skin turgor (good, fair, poor, TENT=tenting)	fair
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	21

Nutrition:

Meal type: NPO then progress to clear liquids and then regular diet with carb counts. *Fluid requirement:* 1730 mL

History: Parents present—patient states that she thinks she has lost weight recently: "My clothes are a little baggy, but I don't usually weigh myself." Patient's mother states that the last weight she remembers was when they went to urgent-care clinic for strep throat and that she weighed about 71 lbs. Mother states that appetite has been normal—if anything patient states she has been more hungry than usual—but thought it was probably due to starting soccer season and exercising more. Relates history of increased thirst and increased urination.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mason, Emma, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 744* **Physician:** *M. Cho* **Admit Date:** *5/3*

Usual intake (for past several months): Mom and Dad state that Emma is kind of a picky eater in that she tries to eat only "healthy" food. She eats only chicken and fish—eats salad, broccoli, carrots, tomatoes, and asparagus as her only vegetables. Breakfast—cereal and milk or whole-wheat bagel with milk; packs lunch for school—peanut butter and jelly or turkey and cheese sandwich; carrots, apple, or grapes; and usually drinks water. Has a cereal or granola bar before softball practice—drinks water throughout practice. Dinner is usually prepared by both Mom and Dad—always some salad and meat with pasta, potato, or rice. They do order in or eat out 1–2 × per week. This is usually pizza, Mexican, or Asian foods. Snacks include cereal, ice cream, yogurt, some fruits (apples, bananas), popcorn, chips, or cookies.

MD Progress Note:
5/5 0820
Subjective: Emma Mason's previous 24 hours reviewed
Vitals: Temp: 99.5°F, Pulse: 82, Resp rate: 25, BP: 101/78
Urine Output: 2660 mL (71.8 mL/kg)

Physical Exam
General: Alert and oriented to person, place, and time
HEENT: WNL
Neck: WNL
Heart: WNL
Lungs: Clear to auscultation
Abdomen: Active bowel sounds
Assessment/Plan: Results: GAD65 AB, IA-2 AB consistent with type 1 DM. Negative TTG.

Dx: New diagnosis type 1 diabetes mellitus

Plan: Change IVF to D_5.45NS with 40MEq K @ 108 mL/hr. Begin Lispro 0.5 u every 2 hours until glucose is 150–200 mg/dL. Tonight, begin glargine 6 u at 9 pm. Progress Lispro using ICR 1:30. Continue bedside glucose checks hourly. Notify MD if blood glucose >200 or <80.

..... M. Cho, MD

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mason, Emma, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 744* **Physician:** *M. Cho* **Admit Date:** *5/3*

Intake/Output

Date		**5/4 0701–5/5 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**NPO**	**NPO**	**320**	**320**
	I.V.	**864**	**864**	**864**	**2592**
	(mL/kg/hr)	(3.4)	(3.4)	(3.4)	(3.4)
	I.V. piggyback				
	PN				
	Total intake (mL/kg)	**864** (27.6)	**864** (27.6)	**1184** (37.8)	**2912** (93.0)
OUT	Urine	**600**	**480**	**1,580**	**2,660**
	(mL/kg/hr)	(2.39)	(1.91)	(6.30)	(10.6)
	Emesis output				
	Other				
	Stool				
	Total output (mL/kg)	**600** (19.1)	**480** (15.3)	**1,580** (50.4)	**2,660** (84.9)
Net I/O		**+264**	**+384**	**−396**	**+288**
Net since admission (5/4)		**+480**	**+684**	**+288**	**+288**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mason, Emma, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 744* **Physician:** *M. Cho* **Admit Date:** *5/3*

Laboratory Results

	Ref. Range	5/4 1780		5/5 0600	
Chemistry					
Sodium, 10–14 y.o. (mEq/L)	136–145	126	!↓	131	!↓
Potassium, 10–14 y.o. (mEq/L)	3.5–5.0	4.3		4.0	
Chloride, 10–14 y.o. (mEq/L)	98–108	99		98	
Carbon dioxide, 10–14 y.o. (mEq/L)	22–30	27		28	
BUN, 10–14 y.o. (mg/dL)	5–18	15		12	
Creatinine serum, 10–14 y.o. (mg/dL)	≤1.2	0.9		0.8	
BUN/Crea ratio	10.0–20.0	16.6		15	
Uric acid, 10–14 y.o. (mg/dL)	2.5–5.5	2.9		2.8	
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	98		113	
Glucose, 10–14 y.o. (mg/dL)	70–99	683	!↑	250	!↑
Phosphate, inorganic, 10–14 y.o. (mg/dL)	2.2–4.6	1.9	!↓	2.1	!↓
Magnesium, 10–14 y.o. (mg/dL)	1.6–2.6	1.7		2.0	
Calcium, 10–14 y.o. (mg/dL)	8.6–10.5	10		9.8	
Anion gap (mmol/L)	10–20	4.0	!↓	9.0	!↓
Osmolality, 10–14 y.o. (mmol/kg/H_2O)	275–295	295.3	!↑	280	
Bilirubin total, 10–14 y.o. (mg/dL)	≤1.2	0.8			
Bilirubin, direct, 10–14 y.o. (mg/dL)	<0.3	0.009			
Protein, total, 10–14 y.o. (g/dL)	6–7.8	6.1			
Albumin, 10–14 y.o. (g/dL)	3.5–5.5	3.7			
Prealbumin, 10–14 y.o. (mg/dL)	17–39	17			
Ammonia, 10–14 y.o. (µg/L)	40–80	41			
Alkaline phosphatase, 10–14 y.o. (U/L)	<500	102			
ALT, 10–14 y.o. (U/L)	3–28	7.1			
AST, 10–14 y.o. (U/L)	19–28	21			
CPK, 10–14 y.o. (U/L)	0–70	31			

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mason, Emma, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 744* **Physician:** *M. Cho* **Admit Date:** *5/3*

Laboratory Results *(Continued)*

	Ref. Range	5/4 1780		5/5 0600	
Lactate dehydrogenase, 10–14 y.o. (U/L)	208–378	208			
Cholesterol, 10–14 y.o. (mg/dL)	<170	124			
Triglycerides, 10–14 y.o. (mg/dL)	<90	55			
T_4, 10–14 y.o. (µg/dL)	5.6–11.7	8.1			
T_3, 10–14 y.o. (µg/dL)	83–213	85			
HbA_{1C}, 10–14 y.o. (%)	3.9–5.2	14.6	!↑		
C-peptide (ng/mL)	0.51–2.72	0.10	!↓		
ICA	—	+	!↑		
GADA	—	+	!↑		
IA-2A	—	+	!↑		
IAA	—	+	!↑		
tTg IgA antibody (U/mL)	<4	2			
tTg IgG antibody (U/mL)	<6	1			
Hematology					
WBC, 10–14 y.o. ($\times 10^3/mm^3$)	4.0–13.5	9.6			
RBC, 10–14 y.o. ($\times 10^6/mm^3$)	3.7–5.3	4.8			
Hemoglobin, 10–14 y.o. (Hgb, g/dL)	11–16	12.5			
Hematocrit, 10–14 y.o. (Hct, %)	31–43	37			
Hematology, Manual Diff					
Neutrophil, 10–14 y.o. (%)	36–38	37			
Lymphocyte, 10–14 y.o. (%)	25–33	28			
Monocyte, 10–14 y.o. (%)	0–7	4			
Eosinophil, 10–14 y.o. (%)	0–5	0			
Basophil, 10–14 y.o. (%)	0–2	1			
Blasts, 10–14 y.o. (%)	3–10	3			
Urinalysis					
Collection method	—	clean catch			
Color	—	yellow			
Appearance	—	clear			

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mason, Emma, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 744* **Physician:** *M. Cho* **Admit Date:** *5/3*

Laboratory Results *(Continued)*

	Ref. Range	5/4 1780		5/5 0600	
Specific gravity, 10–14 y.o.	1.001–1.035	1.036	!↑		
pH, 10–14 y.o.	5–7	4.9	!↓		
Protein (mg/dL)	Neg	+4	!↑		
Glucose (mg/dL)	Neg	+3	!↑		
Ketones	Neg	1	!↑		
Blood	Neg	Neg			
Bilirubin	Neg	Neg			
Nitrites	Neg	Neg			
Urobilinogen, 10–14 y.o. (EU/dL)	<1.0	0.01			
Leukocyte esterase	Neg	Neg			
Prot chk	Neg	+4	!↑		
WBCs, 10–14 y.o. (/HPF)	0–5	3–4			
RBCs, 10–14 y.o. (/HPF)	0–2	0			
Bact	0	0			
Mucus	0	0			
Crys	0	0			
Casts (/LPF)	0	0			
Yeast	0	0			

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. What is currently understood regarding the etiology of type 1 diabetes mellitus (T1DM)? No one else in Emma's family has diabetes—is this unusual? Are there any other findings in her family medical history that would be important to note?

2. According to the American Diabetes Association Standards of Care, what are the standard diagnostic criteria for T1DM? Which criteria are found in Emma's medical record? Examine the labs that were drawn and describe how each is related to the diagnosis of T1DM.

3. Describe the metabolic events that led to Emma's symptoms and subsequent admission to the ED (polyuria, polydipsia, polyphagia, fatigue, and weight loss), integrating the pathophysiology of T1DM into your discussion.

4. Describe the metabolic events that result in the signs and symptoms associated with DKA. Was Emma in DKA when she was admitted? What precipitating factors may lead to DKA?

5. Emma will be started on a combination of Lispro prior to meals and snacks, with glargine given in p.m. Describe the onset, peak, and duration for each of these types of insulin. Her discharge dosages are as follows: 8 u glargine with Lispro prior to each meal or snack—1:30 insulin:carbohydrate ratio. Emma's parents want to know why she cannot take oral medications for her diabetes like some of their friends do. What would you tell them?

6. Emma's physician explains to Emma and her parents that Emma's insulin dose may change due to something called a honeymoon phase. Explain what this is and how it might affect her insulin requirements.

7. How does physical activity affect blood glucose levels? Describe the physiological process that occurs when physical activity impacts blood glucose. Emma is a softball player and usually plays daily. What recommendations will you make to Emma to assist with managing her glucose during exercise and athletic events?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

8. At a follow-up visit, Emma's blood glucose records indicate that her levels have been consistently high when she wakes in the morning before breakfast. What factors might influence high fasting blood glucose in the morning?

9. What do the current ADA Standards of Care recommend for Emma to check her blood glucose level?

10. Emma's parents state that they now understand the symptoms she was experiencing are related to hyperglycemia. Discuss factors that may raise Emma's blood glucose in the future.

11. Emma's parents state they are unclear of the symptoms of hypoglycemia. Explain those symptoms to Emma and her parents as well as the likely causes of hypoglycemia. What are the treatments for hypoglycemia and what emergency supplies should they have available to treat hypoglycemia?

II. Understanding the Nutrition Therapy

12. The MD ordered a carbohydrate-controlled diet for when Emma begins to eat. Explain the rationale for monitoring carbohydrate in diabetes nutrition therapy.

13. Outline the basic principles for Emma's nutrition therapy to assist in control of her T1DM.

III. Nutrition Assessment

14. Assess Emma's z-scores for ht/age; z-scores for wt/age; z-scores for ht/wt; and BMI for age.
What is her desirable weight? What is the impact of T1DM on growth?
Evaluate Emma's weight loss using the pediatric malnutrition standards.
What do you anticipate will happen when Emma begins insulin therapy?

15. Identify any additional abnormal laboratory values measured upon her admission. Explain how they may be related to her newly diagnosed T1DM.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

16. Determine Emma's energy and protein requirements. Be sure to explain what standards you used to make this estimation.

IV. Nutrition Diagnosis

17. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

18. Determine Emma's initial nutrition prescription using her usual intake at home as a guideline, as well as your assessment of her energy requirements.

19. What is an insulin:CHO ratio (ICR)? Dr. Cho ordered her ICR to start at 1:30. If her usual breakfast is one slice of WW toast with 1 T. peanut butter and 8 oz skim milk, how much Lispro should she take to cover the carbohydrate in this meal?

20. Dr. Cho set Emma's fasting blood glucose goal at 90–180 mg/dL. Her total daily insulin dose is 17 u and her fasting a.m. blood glucose is 240 mg/dL. Using the 1800 rule, what would her correction dose be?

VI. Nutrition Monitoring and Evaluation

21. Write an ADIME note for your initial nutrition assessment.

22. When Emma comes back to the clinic 3 weeks later, she brings the following food and blood glucose record with her.

a. Determine the amount of carbohydrates she is consuming at each meal.

b. Determine whether she is taking adequate amounts of Lispro for each meal according to her record.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

c. Is she taking in adequate energy and protein?

d. What might be the next topics you discuss with Emma and her family in regard to her nutrition plan? She really wants to start playing softball again soon.

Time	Diet	Grams of CHO	Exercise	BG (mg/dL)	Insulin dosages	
					What patient took	What you would recommend
7:30 a.m.	2 slices WW toast 1 banana 16 oz skim milk with Ovaltine (2 tbsp)			(Pre) 150	1 u Lispro	
10:30 a.m.						
12 noon	2 slices of pepperoni pizza 2 chocolate chip cookies Water			(Pre) 180	2 u Lispro	
2 p.m.	Granola bar		PE class—30 minutes			
4:30 p.m.	Apple 6 saltines with 2 tbsp peanut butter			(Pre) 110		
5–6:30 p.m.	16 oz Gatorade		Soccer practice—1.5 hours	(Pre) 140		
6:30 p.m.	Chicken with broccoli stir-fry (1 c fried rice, 2 oz chicken, ½ c broccoli) 1 egg roll 2 c skim milk			(Pre) 80	3 u Lispro	
8:30 p.m.	2 c ice cream With 2 tbsp peanuts			(Pre) 120	2 u Lispro	
10:30 p.m.	Bed				8 u Glargine	

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

American Diabetes Association. Standards of medical care in diabetes—2020. *Diabetes Care.* 2020;43(S1): S1-S212.

Becker P, Carney LN, Corkins MR, et al. Consensus statement of the Academy of Nutrition and Dietetics/ American Society for Parenteral and Enteral Nutrition: Indicators recommended for the identification and documentation of pediatric malnutrition (undernutrition). *Nutrition in Clinical Practice.* 2014;30(1):147–161.

Centers for Disease Control and Prevention. *National Diabetes Statistics Report, 2020.* Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2020. https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf. Accessed April 17, 2020.

Fayfman M, Pasquel FJ, Umpierrez GE. Management of hyperglycemic crises: Diabetic ketoacidosis and hyperglycemic hyperosmolar state. *Med Clin North Am*. 2017;101:86–606.

Franz MJ, Macleod J, Evert A, et al. Academy of Nutrition and Dietetics nutrition practice guideline for type 1 and type 2 diabetes in adults: Systematic review of evidence for medical nutrition therapy effectiveness and recommendations for integration into the nutrition care process. *J Acad Nutr Diet*. 2017;117:1659–1679.

Medications: Consumer Guide 2020. *Diabetes Forecast.* http://www.diabetesforecast.org/2020/02-mar-apr/consumer-guide-2020.html. Published March 2020. Accessed April 19, 2020.

Nahikian-Nelms M. Diseases of the endocrine system. In Nelms M, Sucher K, *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2020:477–528.

Powers AC, Niswender KD, Evans-Molina C. Diabetes mellitus: Diagnosis, classification, and pathophysiology. In Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, eds. *Harrison's Principles of Internal Medicine. 20th ed.* New York, NY: McGraw-Hill; 2018. http://accessmedicine.mhmedical.com/content.aspx?bookid=2129&sectionid=192288322. Accessed April 19, 2020.

Powers AC, Niswender KD, Rickels MR. Diabetes mellitus: Management and therapies. In Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, eds. *Harrison's Principles of Internal Medicine. 20th ed.* New York, NY: McGraw-Hill; 2018. http://accessmedicine.mhmedical.com/content.aspx?bookid=2129&sectionid=192288412. Accessed April 19, 2020.

Internet Resources

American Diabetes Association: http://www.diabetes.org/

AND Evidence Analysis Library: http://www.andeal.org

International Society for Pediatric and Adolescent Diabetes: http://www.ispad.org/

JDRF Kids: http://jdrf.org/hello-jdrf-kids-online-community/

Peditools.org

Pediatric Nutrition Care Manual: http://www.nutritioncaremanual.org

Type One Nation: http://typeonenation.org/

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 15

Type 2 Diabetes Mellitus: New Adult Diagnosis

Gabriela Hererra is a 40-year-old female who has recently learned that her annual physical revealed abnormal laboratory values. She presents to her physician's office for further evaluation.

Objectives

After completing this case, the student will be able to:

1. Describe the pathophysiology of type 2 diabetes mellitus.
2. Identify and apply the diagnostic criteria for type 2 diabetes mellitus.
3. Interpret laboratory parameters to glucose control and cardiovascular risk.
4. Understand the chronic complications of hyperglycemia and long-term health implications of uncontrolled diabetes.
5. Identify and integrate additional lifestyle interventions that are appropriate for this newly diagnosed individual with type 2 diabetes mellitus.
6. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses for this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Hererra, Gabriela, *Female, 40 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Family Practice* **Physician:** *C. Harris* **Admit Date:** *7/1*

iStock.com/Juanmonino

Patient Summary: Gabriela Hererra is a 40-year-old female here for annual physical.

History:
Chief Complaint: Patient is a 40-year-old female here for f/u after annual physical. She had been notified by this office that some of her lab values were abnormal and she is here for that evaluation.
Past medical history: Para 2 Gravida 2; male full-term 9# 8 oz; female full-term 9# 4 oz. Gestational diabetes with both pregnancies.
Surgical history: None
Medications at home: Multivitamin; calcium and vitamin D supplements
Tobacco use: None
Alcohol use: Social, 1–2 drinks per week
Family history: Father—MI; mother, sister—T2DM

Demographics:
Marital status: Divorced
Children: male—15 yrs, female—12 yrs
Years education: 16
Language: English/Spanish
Occupation: Health information management systems analyst
Hours of work: 8–5 M–F, some weekends
Ethnicity: Latina
Religious affiliation: Catholic
General appearance: Overweight, slightly anxious female

Vital Signs:

Temp: 98.6°F	Pulse: 99	Resp rate: 24
BP: 87/135	Height: 5'4"	Weight: 182 lbs

Heart: tachycardia
HEENT: Head: WNL
Eyes: PERRLA
Ears: clear
Nose: clear
Throat: dry mucous membranes without exudates or lesions
Genitalia: Deferred
Neurologic: Alert and oriented
Extremities: ROM ×4; DTR ×2; positive pinprick evaluation; no foot deformity or ulcerations
Skin: Warm and dry
Chest/lungs: Respirations WNL—clear to auscultation and percussion. No rhonchi, wheezes, or rubs.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Hererra, Gabriela, *Female, 40 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Family Practice* **Physician:** *C. Harris* **Admit Date:** *7/1*

Peripheral vascular: Pulse 4+ bilaterally, warm, no edema
Abdomen: Active bowel sounds × 4; nontender to palpation, nondistended

Assessment/Plan: Results: HbA_{1C} 7.7%, fasting serum glucose of 165 mg/dL, high serum insulin, negative C-peptide consistent with type 2 DM diagnosis
Renal Function: Normal BUN, Cr, negative microalbuminuria
Cardiac/Lipid Profile: BP WNL; hyperlipidemia; hypertriglyceridemia; hypercholesterolemia

Dx: Type 2 diabetes mellitus

Plan: Initiate metformin 500 mg one time daily.
Initiate Atorvastatin 40 mg one time daily.
Referrals: Optometrist, outpatient pharmacist/CDE, outpatient dietetics/CDE.

..... C. Harris, MD

Nutrition:
History: Patient states that she currently is not following any special diet. She does remember avoiding sugar and desserts when she had gestational diabetes during her pregnancies but that was the extent of any dietary changes. She is at her highest nonpregnant weight.
Usual intake (for past several months):
AM: Coffee and some type of doughnut or sweet roll when she gets to work.
Lunch: Leftovers from previous evening or purchases from Panera or other restaurant—typically sandwich or salad; chips, iced tea and occasionally cookie or dessert.
Dinner: Cooks for her family almost every night—all types of meats, rice usually, variety of vegetables. Eats out typically once per week at dinner.
Snacks: Usually hungry when she gets home so has cheese, crackers, or chips. Often nibbles while cooking as well. Typically has snack while watching TV at night—popcorn, ice cream, or other sweets.
Alcohol: Occasional beer or wine but not more than one on weekend.
Physical Activity: Sedentary job but does like to walk with her neighbor on weekends. Has previously tried to walk during workday but hasn't kept up with the effort.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Hererra, Gabriela, *Female, 40 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Family Practice* **Physician:** *C. Harris* **Admit Date:** *7/1*

Laboratory Results

	Ref. Range	7/1 1780
Chemistry		
Sodium (mEq/L)	136–145	138
Potassium (mEq/L)	3.5–5.1	3.6
Chloride (mEq/L)	98–107	99
Carbon dioxide (mEq/L)	23–29	25
BUN (mg/dL)	6–20	18
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	0.9
BUN/Crea ratio	10.0–20.0	20
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.2
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	88
Glucose (mg/dL)	70–99	165 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	2.7
Magnesium (mg/dL)	1.5–2.4	1.9
Calcium (mg/dL)	8.6–10.2	10
Anion gap (mmol/L)	10–20	12.0
Osmolality (mmol/kg/H_2O)	275–295	292
Bilirubin, total (mg/dL)	≤1.2	0.2
Bilirubin, direct (mg/dL)	<0.3	0.01
Protein, total (g/dL)	6–7.8	6.9
Albumin (g/dL)	3.5–5.5	4.4
Prealbumin (mg/dL)	18–35	32
Ammonia (µg/L)	6–47	9
Alkaline phosphatase (U/L)	30–120	110
ALT (U/L)	4–36	6.2
AST (U/L)	0–35	21
CPK (U/L)	30–135 F 55–170 M	61
Lactate dehydrogenase (U/L)	208–378	229
Cholesterol (mg/dL)	<200	220 !↑

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Hererra, Gabriela, *Female, 40 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Family Practice* **Physician:** *C. Harris* **Admit Date:** *7/1*

Laboratory Results *(Continued)*

	Ref. Range	7/1 1780
HDL-C (mg/dL)	>50 F, >40 M	42
LDL (mg/dL)	0–99	143 !↑
LDL/HDL ratio	<4.5	3.4
Triglycerides (mg/dL)	<150	175 !↑
T_4 (µg/dL)	5–12	7.2
T_3 (µg/dL)	75–98	81
HbA_{1C} (%)	<5.7	7.7 !↑
C-peptide (ng/mL)	0.51–2.72	0.09 !↓
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	10.6
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	5.8
Urinalysis		
Collection method	—	clean catch
Color	—	yellow
Appearance	—	clear
Specific gravity	1.001–1.035	1.008
pH	5–7	5.5
Protein (mg/dL)	Neg	+1 !↑
Glucose (mg/dL)	Neg	+1 !↑
Ketones	Neg	+1 !↑
Blood	Neg	Neg
Bilirubin	Neg	Neg
Nitrites	Neg	Neg
Urobilinogen (EU/dL)	<1.0	0.003
Leukocyte esterase	Neg	Neg
Prot chk	Neg	+1

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Hererra, Gabriela, *Female, 40 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Family Practice* **Physician:** *C. Harris* **Admit Date:** *7/1*

Laboratory Results *(Continued)*

	Ref. Range	7/1 1780
WBCs (/HPF)	0–5	0
RBCs (/HPF)	0–2	0
Bact	0	0
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. Describe the multifactorial etiologies for type 2 diabetes mellitus. What do you see in Ms. Herrera's history that increases her risk for diabetes?

2. Explain the basic pathophysiology of type 2 diabetes mellitus. What is the primary difference between T1DM and T2DM?

3. Using the American Diabetes Association treatment guidelines, how should T2DM be diagnosed? Is there adequate information in Ms. Herrera's record to make this diagnosis?

4. Ms. Herrera's physician's note addressed cardiac function and renal function. Why are these organ systems a component of the evaluation for someone with diabetes? Using the laboratory results from her record, please describe her cardiac and renal disease risk. Using the American Diabetes Association treatment guidelines, what other evaluations are recommended for an individual with newly diagnosed DM?

5. Ms. Herrera's mother has T2DM. She is currently having problems with vision and burning in her feet. What is she most likely experiencing? Describe the pathophysiology of these complications. You can tell that Ms. Herrera is worried not only about her mother but also her own health. Explain, using the results of the Diabetes Control and Complications Trial (DCCT) as well as any other pertinent research trials and data, how she can prevent these complications.

6. Ms. Herrera was prescribed metformin for her T2DM. What is the mechanism for this medication? What are the potential side effects? The ADA treatment guidelines indicate that the next line of medication would be the SGL2. What is the mechanism for this medication? Ms. Herrera tells you that her mother is on glipizide. How does this medication differ from metformin?

II. Understanding the Nutrition Therapy

7. Outline the basic principles for Ms. Herrera's nutrition therapy to assist in control of her DM. How will you combine the nutrition therapy for both hyperlipidemia and her diabetes without overwhelming her?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

III. Nutrition Assessment

8. Assess Ms. Herrera's height and weight. Calculate her BMI.

9. Identify any abnormal laboratory values measured upon her admission. Explain how they may be related to her newly diagnosed DM.

10. Determine Ms. Herrera's energy and protein requirements. Be sure to explain what standards you used to make this estimation. Would you recommend that she lose weight?

IV. Nutrition Diagnosis

11. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

12. Determine Ms. Herrera's initial medical nutrition therapy prescription using her usual intake as a guideline, as well as your assessment of her energy requirements that you determined in question 10. What nutrition education material would you use to teach Ms. Herrera about her nutrition therapy interventions?

13. Using the ADA guidelines, what are the recommendations for Ms. Herrera's self–blood glucose monitoring? What would be appropriate fasting and postprandial target glucose levels for Ms. Herrera?

VI. Nutrition Monitoring and Evaluation

14. Write an ADIME note for your initial nutrition assessment.

15. Ms. Herrera comes back to the clinic one month after her diagnosis. List the key questions you will ask her in order to plan the next steps for providing any additional education that she needs.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics. Diabetes DPG patient education handouts. https://www.dce.org/publications/education-handouts. Accessed April 21, 2020.

American Diabetes Association. Standards of medical care in diabetes—2020. *Diabetes Care*. 2020;43(S1): S1–S212.

Arnett DK, Blumenthal RS, Albert MA, et al. 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease: A report of the American College of Cardiology/American Heart Association Task Force of Clinical Practice Guidelines. *Circulation*. 2018;140:e596–e646.

Centers for Disease Control and Prevention. *National Diabetes Statistics Report, 2020*. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2020. https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf. Accessed April 17, 2020.

Franz MJ, Macleod J, Evert A, et al. Academy of Nutrition and Dietetics nutrition practice guideline for type 1 and type 2 diabetes in adults: Systematic review of evidence for medical nutrition therapy effectiveness and recommendations for integration into the nutrition care process. *J Acad Nutr Diet*. 2017;117: 1659–1679.

Grundy SM, Stone NJ, Bailey AL, et al. 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA guideline on the management of blood cholesterol: Executive summary. *J Am Coll Cardiol*. 2019;73(24). doi: 10.1016/j.jacc.2018.11.003. Updated June 25, 2019. Accessed April 17, 2020.

Medications: Consumer Guide 2020. *Diabetes Forecast*. http://www.diabetesforecast.org/2020/02-mar-apr/consumer-guide-2020.html. Published March 2020. Accessed April 19, 2020.

Nahikian-Nelms M. Diseases of the endocrine system. In Nelms M, Sucher K, *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2020:477–528.

Powers AC, Niswender KD, Evans-Molina C. Diabetes mellitus: Diagnosis, classification, and pathophysiology. In Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, eds. *Harrison's Principles of Internal Medicine,* 20th ed. New York, NY: McGraw-Hill; 2018. http://accessmedicine.mhmedical.com/content.aspx?bookid=2129&sectionid=192288322. Accessed April 19, 2020.

Powers AC, Niswender KD, Rickels MR. Diabetes mellitus: Management and therapies. In Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, eds. *Harrison's Principles of Internal Medicine,* 20th ed. New York, NY: McGraw-Hill; 2018. http://accessmedicine.mhmedical.com/content.aspx?bookid=2129&sectionid=192288412. Accessed April 19, 2020.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. *2015–2020 Dietary Guidelines for Americans*. 8th ed. https://health.gov/our-work/food-nutrition/2015-2020-dietary-guidelines/guidelines/. Published December 2015. Accessed April 20, 2020.

Internet Resources

American Diabetes Association: http://www.diabetes.org/
AND Evidence Analysis Library: http://www.andeal.org
Nutrition Care Manual: http://www.nutritioncaremanual.org
Diabetes Daily: www.diabetesdaily.com

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 16

Adult Type 2 Diabetes Mellitus: Transition to Insulin

Mr. Fagan is a 57-year-old with type 2 diabetes mellitus who has a history of noncompliance. He is admitted through the ED with severe hyperglycemia and dehydration.

Objectives

After completing this case, the student will be able to:

1. Describe the pathophysiology of type 2 diabetes mellitus and hyperglycemic hyperosmolar state.
2. Explain the pharmacology of oral medications for type 2 DM.
3. Integrate an insulin regimen with nutrition therapy and provide appropriate recommendations for carbohydrate-to-insulin ratios and correction dosages.
4. Explain the appropriate use and interpretation of self-monitoring of blood glucose to adjust rapid-acting insulin.
5. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses for this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fagan, Mitchell, *Male, 57 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *R. Petersen* **Admit Date:** *4/12*

iStock.com/dfbimages

Patient Summary: Mitchell Fagan is a 57-year-old male admitted with acute hyperglycemia and probable HHS.

History:
Onset of disease: Patient's coworker became concerned when patient did not report to work or answer his phone when called. Coworker went to patient's home and found him drowsy and confused. Took patient to ED, where patient was noted to have serum glucose of 855 mg/dL.
Medical history: Type 2 DM × 1 year—prescribed glyburide and metformin but admits that he has not taken the medications regularly; HTN; hyperlipidemia; gout
Surgical history: ORIF R ulna; hernia repair
Medications at home: Glyburide 20 mg daily; 500 mg metformin twice daily; 25 mg hydrochlorothiazide and 37.5 mg triamterene; Atorvastatin 20 mg daily
Tobacco use: 1 ppd × 20 years—now quit
Alcohol use: 3–4 drinks per week
Family history: Father—HTN, CAD; mother—type 2 DM

Demographics:
Marital status: Single
Years education: 16
Language: English only
Occupation: Retired military—now works as consultant to military equipment company
Hours of work: 8–5 weekdays
Household members: NA—lives alone
Ethnicity: Caucasian
Religious affiliation: NA

Admitting History/Physical:
Chief complaint: "I had a lot of vomiting that I thought at first was food poisoning, but I just kept getting worse." When questioned about medications, patient admits that he has not taken medications for the diabetes regularly: "I hate how they make me feel, but I almost always take my other medications for blood pressure and cholesterol."

General: 0 Obese, 57-year-old male

Temp: 100.5°F	Pulse: 105	Resp rate: 26
BP: 90/70	Height: 5'9"	Weight: 214 lbs

HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: dry oral mucosa pale, dentition in good repair
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.
Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Respirations rapid. Lungs are clear to auscultation bilaterally.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fagan, Mitchell, *Male, 57 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *R. Petersen* **Admit Date:** *4/12*

Abdominal: Abdomen tense, tender, with hyperactive bowel sounds in all four quadrants. No masses, no organomegaly. No guarding, rebound, or CVA tenderness.
Extremities: Normal range of motion in all four extremities. No cyanosis or clubbing or peripheral edema.
Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Skin is warm. Pt is diaphoretic. Poor turgor.
Psychiatric: Appropriate mood and affect for clinical situation.

Orders:

1. Replace 1 L NS stat. Then begin regular insulin. 1 unit/kg/hr in NS 40 mEq KCl/liter @ 500 mL/ hr × 3 hours. Then regular insulin 1 unit/mL NS 10 mEq KCl/liter @ 135 mL/hr. Flush new IV tubing with 50 mL of insulin drip solution prior to connecting to patient and starting insulin infusion.
2. Labs: BMP, phos, calcium
   UA with culture Stat clean catch
   Bedside glucose Stat
   Bedside I-Stat: EG7 Stat
   Islet cell autoantibodies screen
   Thyroid peroxidase antibodies; TSH; thyroglobulin antibodies
   Comp metabolic panel (CMP); hematology panel
   C-peptide
   Hemoglobin A_{1c}
   Tissue transglutaminase antibodies
3. NPO except for ice chips and medications. After 12 hours, clear liquids if stable. Then, advance to consistent-carbohydrate diet. Consult dietitian for advancement, total carbohydrate Rx, and distribution.
4. Consult diabetes education team for self-management training for patient after stabilized and when transferred to floor.

Nursing Assessment	**4/12**
Abdominal appearance (concave, flat, rounded, obese, distended)	obese
Palpation of abdomen (soft, rigid, firm, masses, tense)	tense
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	hyper
LUQ	hyper
RLQ	hyper
LLQ	hyper
Stool color	light brown
Stool consistency	soft
Tubes/ostomies	NA

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fagan, Mitchell, *Male, 57 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *R. Petersen* **Admit Date:** *4/12*

Nursing Assessment *(Continued)*

Nursing Assessment	4/12
Genitourinary	
Urinary continence	yes
Urine source	clean specimen
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	cloudy, amber
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	DI
Skin turgor (good, fair, poor, TENT=tenting)	poor
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	20

Nutrition:

Meal type: NPO, then progress to clear liquids and then consistent carbohydrate-controlled diet
Fluid requirement: 2000–2500 mL after rehydration
History: Patient states that he really doesn't follow any strict diet except for not adding salt—tries to avoid high-cholesterol foods and stays away from high-sugar desserts. Prior to arriving to ED, he had experienced vomiting for approximately 12–24 hours and so had not eaten anything and only has had sips of water. He has never seen anyone for diabetes teaching, beyond what his physician has told him.

Typical intake (for past several months): AM: Coffee with half and half
Midmorning: Bagel with cream cheese, 2–3 c of coffee
Lunch: Out at restaurant—usually Jimmy John's or fast-food sandwich, chips, and diet soda
Dinner: Cooks sometimes at home—this would be grilled chicken or beef, salad, and potatoes or rice. Often will meet friends for dinner—likes all foods and especially likes to try different ethnic foods such as Chinese, Mexican, Indian, or Thai.

MD Progress Note:

4/13 0750
Mitchell Fagan's previous 24 hours reviewed
Vitals: Temp: 99.6°F, Pulse: 83, Resp rate: 25, BP: 129/92

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fagan, Mitchell, *Male, 57 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *R. Petersen* **Admit Date:** *4/12*

Physical Exam
General: Alert and oriented to person, place, and time
Cardiac: WNL
Pulmonary: Clear to auscultation
Abdominal: Active bowel sounds. N, V resolved.

Assessment/Plan:
Results: Negative ICA, GADA, IAA, negative tTg, +C-peptide with insulin level indicating T2DM—now requiring insulin at home

Dx: Type 2 DM uncontrolled with HHS

Plan: Change IVF to D_5.45NS with 20MEq K @ 135 mL/hr. Begin Lispro 0.5 u every 2 hours until glucose is 150–200 mg/dL. Tonight begin glargine 19 u at 9 p.m. Progress Lispro using ICR 1:15. Continue bedside glucose checks hourly. Notify MD if blood glucose >200 or <80.

R. Peterson, MD

Intake/Output

Date		**4/12 0701–4/13 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**NPO**	**NPO**	**NPO**	
	I.V.	**2,175**	**1,080**	**1,080**	**4,335**
	(mL/kg/hr)	(2.80)	(1.39)	(1.39)	(1.86)
	I.V. piggyback	**0**	**0**	**0**	**0**
	PN	**0**	**0**	**0**	**0**
	Total intake (mL/kg)	**2,175** (22.4)	**1,080** (11.1)	**1,080** (11.1)	**4,335** (44.6)
OUT	Urine	**1,100**	**450**	**525**	**2,075**
	(mL/kg/hr)	(1.41)	(0.58)	(0.67)	(0.89)
	Emesis output	**120**	**0**	**0**	**120**
	Other	**0**	**0**	**0**	**0**
	Stool	**0**	**×1**	**0**	
	Total output (mL/kg)	**1,220** (12.5)	**450** (4.6)	**525** (5.4)	**2,195** (22.6)
Net I/O		**+955**	**+630**	**+555**	**+2,140**
Net since admission (4/12)		**+955**	**+1,585**	**+2,140**	**+2,140**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fagan, Mitchell, *Male, 57 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *R. Petersen* **Admit Date:** *4/12*

Laboratory Results

	Ref. Range	4/12 1780	4/13 1522
Chemistry			
Sodium (mEq/L)	136–145	132 !↓	135 !↓
Potassium (mEq/L)	3.5–5.1	3.9	4.0
Chloride (mEq/L)	98–107	101	100
Carbon dioxide (mEq/L)	23–29	27	28
BUN (mg/dL)	6–20	31 !↑	20
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.9 !↑	1.3
BUN/Crea ratio	10.0–20.0	16	15.3
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.3	5.9
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	39 !↓	62
Glucose (mg/dL)	70–99	855 !↑	475 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	1.8 !↓	2.1 !↓
Magnesium (mg/dL)	1.5–2.4	1.9	2.1
Calcium (mg/dL)	8.6–10.2	10	9.8
Anion gap (mmol/L)	10–20	6.0 !↓	11
Osmolality (mmol/kg/H_2O)	275–295	322.6 !↑	303.5 !↑
Bilirubin, total (mg/dL)	≤1.2	0.9	
Bilirubin, direct (mg/dL)	< 0.3	0.019	
Protein, total (g/dL)	6–7.8	7.1	
Albumin (g/dL)	3.5–5.5	4.9	
Prealbumin (mg/dL)	18–35	33	
Ammonia (µg/L)	6–47	15	
Alkaline phosphatase (U/L)	30–120	112	
ALT (U/L)	4–36	21	
AST (U/L)	0–35	17	
CPK (U/L)	30–135 F 55–170 M	145	
Lactate dehydrogenase (U/L)	208–378	275	
Cholesterol (mg/dL)	<200	205 !↑	
HDL-C (mg/dL)	>50 F, >40 M	55	
VLDL (mg/dL)	7–32	37 !↑	

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fagan, Mitchell, *Male, 57 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *R. Petersen* **Admit Date:** *4/12*

Laboratory Results *(Continued)*

	Ref. Range	4/12 1780	4/13 1522
LDL (mg/dL)	0–99	123 ↑	
LDL/HDL ratio	<4.5	2.24	
Triglycerides (mg/dL)	<150	185 !↑	
T_4 (µg/dL)	5–12	12	
T_3 (µg/dL)	75–98	77	
HbA_{1C} (%)	<5.7	11.5 !↑	
C-peptide (ng/mL)	0.51–2.72	1.10	
ICA	—	Neg	
GADA	—	Neg	
IA-2A	—	Neg	
IAA	—	Neg	
tTg IgA antibody (U/mL)	<4	2	
tTg IgG antibody (U/mL)	<6	1	
Hematology			
WBC ($\times 10^3/mm^3$)	3.9–10.7	13.5 !↑	
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	6.1	
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	14.5	
Hematocrit (Hct, %)	37–47 F 41–51 M	57 !↑	
Urinalysis			
Collection method	—	clean catch	
Color	—	amber	
Appearance	—	Cloudy	
Specific gravity	1.001–1.035	1.045 !↑	
pH	5–7	5.1	
Protein	Neg	10 !↑	
Glucose	Neg	+3 !↑	

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Fagan, Mitchell, *Male, 57 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *R. Petersen* **Admit Date:** *4/12*

Laboratory Results *(Continued)*

	Ref. Range	4/12 1780	4/13 1522
Ketones	Neg	+1 !↑	
Blood	Neg	Neg	
Bilirubin	Neg	Neg	
Nitrites	Neg	Neg	
Urobilinogen (EU/dL)	<1.0	0.01	
Leukocyte esterase	Neg	Neg	
Prot chk	Neg	+	
WBCs (/HPF)	0–5	3	
RBCs (/HPF)	0–2	1	
Bact	0	0	
Mucus	0	0	
Crys	0	0	
Casts (/LPF)	0	0	
Yeast	0	0	

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. What are the standard diagnostic criteria for T2DM? Identify those found in Mr. Fagan's medical record.

2. Mr. Fagan was previously diagnosed with T2DM. He admits that he often does not take his medications. What types of medications are metformin and glyburide? Describe their mechanisms as well as their potential side effects/drug–nutrient interactions.

3. What other medications does Mr. Fagan take? List their mechanisms and potential side effects/drug–nutrient interactions.

4. Describe the metabolic events that led to Mr. Fagan's symptoms and subsequent admission to the ED with the diagnosis of uncontrolled T2DM with hyperglycemic hyperosmolar syndrome (HHS). Be sure to include the information in Mr. Fagan's chart that supports this diagnosis. Compare and contrast HHS with the other common clinical emergency condition of diabetes—diabetic ketoacidosis (DKA).

5. HHS is often associated with dehydration. After reading Mr. Fagan's chart, list the data that are consistent with dehydration. What factors in Mr. Fagan's history may have contributed to his dehydration?

6. Assess Mr. Fagan's intake/output record for the first 24 hours of his admission. What does this tell you? Assuming that Mr. Fagan tells you that his usual weight is 228 lbs, can you estimate the volume of his dehydration?

7. Mr. Fagan was started on normal saline with potassium as well as an insulin drip. Why are these fluids a component of his rehydration and a correction of the HHS?

8. Describe the insulin therapy that was started for Mr. Fagan. What is Lispro? What is glargine? How likely is it that Mr. Fagan will need to continue insulin therapy?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

II. Understanding the Nutrition Therapy

9. Mr. Fagan was NPO when admitted to the hospital. What does this mean? What are the signs that will alert the RDN and physician that Mr. Fagan may be ready to eat?

10. Outline the basic principles for Mr. Fagan's nutrition therapy to assist in control of his DM.

III. Nutrition Assessment

11. Assess Mr. Fagan's weight and BMI. What would be a healthy weight range for him?

12. Identify and discuss any abnormal laboratory values measured upon Mr. Fagan's admission. How did they change after hydration and initial treatment of his HHS?

13. Determine Mr. Fagan's energy and protein requirements for weight maintenance. What energy and protein intakes would you recommend to assist with weight loss?

IV. Nutrition Diagnosis

14. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

15. Determine Mr. Fagan's initial CHO prescription using his diet history as well as your assessment of his energy requirements.

16. Identify two initial nutrition goals to assist with weight loss.

17. Mr. Fagan also has hypertension and high cholesterol levels. Describe how your nutrition interventions for diabetes can include nutrition therapy for his other conditions.

VI. Nutrition Monitoring and Evaluation

18. Write an ADIME note for your initial nutrition assessment.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Nutrition Care Manual. Type 2 diabetes mellitus. https://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=1&lv1=5517&lv2=18469&ncm_toc_id=18469&ncm_heading=Nutrition20Care. Accessed February 21, 2020.

Academy of Nutrition and Dietetics/American Diabetes Association. *Choose Your Foods: Food Lists for Weight Management.* Chicago, IL: Academy of Nutrition and Dietetics; 2014.

Academy of Nutrition and Dietetics/American Diabetes Association. *Count Your Carbs: Getting Started.* Chicago, IL: Academy of Nutrition and Dietetics; 2014.

American Diabetes Association. Lifestyle management: Standards of medical care in diabetes—2018. *Diabetes Care.* 2018;41(Suppl 1):S38–50.

American Diabetes Association. Standards of medical care in diabetes—2020. *Diabetes Care.* 2020; 43:S1–S224.

Chaithongdi N, Subauste JS, Koch CA, Geraci SA. Diagnosis and management of hyperglycemic emergencies. *Hormones.* 2011;10:250–260.

Corwell B, Knight B, Olivieri L, Willis GC. Current diagnosis and treatment of hyperglycemic emergencies. *Emerg Med Clin N Am*. 2014;32:437–452.

Dehydration: Symptoms & causes. mayoclinic.org https://www.mayoclinic.org/diseases-conditions/dehydration/symptoms-causes/syc-20354086. Updated September 19, 2019. Accessed February 21, 2020.

Diabetic Ketoacidosis and Hyperosmolar Coma. In Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, eds. *Harrison's Manual of Medicine. 20th ed.* New York, NY: McGraw-Hill; 2018. http://accessmedicine.mhmedical.com/content.aspx?bookid=2738&sectionid=227555812. Accessed May 05, 2020.

Franz MJ, Macleod J, Evert A, et al. Academy of Nutrition and Dietetics nutrition practice guideline for type 1 and type 2 diabetes in adults: Systematic review of evidence for medical nutrition therapy effectiveness and recommendations for integration into the nutrition care process. *J Acad Nutr Diet.* 2017;117:1659–1679.

Hemphill RR. Hyperosmolar hyperglycemic state. *Medscape*. http://emedicine.medscape.com/article/1914705-overview. Updated January 14, 2019. Accessed May 5, 2020.

Insulin pens: Consumer guide 2020. *Diabetes Forecast.* http://main.diabetes.org/dforg/pdfs/2020/2020-cg-insulin-pens.pdf?utm_source=Offline&utm_medium=Print&utm_content=insulinpens&utm_campaign=DF&s_src=vanity&s_subsrc=insulinpens. Published January 2020. Accessed February 20, 2020.

Kitabchi AE, Umpierrex GE, Fisher JN, Murph Stentz FB. Thirty years of personal experience in hyperglycemic crises: Diabetic ketoacidosis and hyperglycemic hyperosmolar state. *J Clin Endocrinol Metab.* 2008; 93:1541–1552.

Nahikian-Nelms M. Diseases of the endocrine system. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:477–528.

Nyenwe EA, Kitabchi AE. Evidence-based management of hyperglycemic emergencies in diabetes mellitus. *Diabetes Res Clin Prac.* 2011;94:340–351.

Pasquel FJ, Umpierrez GE. Hyperosmolar hyperglycemic state: A historic review of the clinical presentation, diagnosis, and treatment. *Diabetes Care.* 2014;37:3124–3131.

Internet Resources

American Diabetes Association: http://www.diabetes.org/
AND Evidence Analysis Library: http://www.andeal.org

The Metabolomics Innovation Centre (TMIC): Drug Bank: http://www.drugbank.ca/

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Seven

NUTRITION THERAPY FOR RENAL DISORDERS

There has been a continued recognition for the essential role of medical nutrition therapy for patients with chronic kidney disease (CKD). The importance of nutrition in the care of patients with CKD is illustrated by the fact that indicators of nutritional status effectively predict morbidity and mortality in these patients. In 2017, the incidence rate for end-stage kidney disease was 340.7 cases per million. This translates to over 20 million Americans who had clinical evidence of kidney disease. Of this number, more than 85,000 Americans die each year because of kidney disease, and more than 485,000 suffer from advanced CKD and need renal replacement therapy to remain alive. Kidney disease is one of the most expensive illnesses. In 2011, more than $50 billion was spent on renal replacement therapy (available at http:/ https://www.usrds.org/2019/view/USRDS_2019_ES_final.pdf, accessed May 9, 2020).

The primary cause of CKD is diabetes mellitus, which accounts for about 44% of all new cases each year. Uncontrolled hypertension is the second leading cause of CKD in the United States.

Case 17 demonstrates the progression of renal disease and the most common form of renal replacement therapy, hemodialysis. Integrated into each case are factors that predispose an individual to CKD, such as diabetes mellitus and ethnicity. Incidence in African Americans is three times the rate seen in non-Hispanic whites. The Office of Minority Health at the U.S. Department of Health and Human Services estimates that CKD caused by diabetes mellitus is 2.5 times more prevalent in Alaska Natives and American Indians than in non-Hispanic whites. Principles such as dietary modification for nutrient composition in impaired renal function, medical care of CKD, and renal replacement therapy are included within these cases. Case 18 addresses an additional treatment option for CKD—renal transplant. In 2017, the number of people on the kidney transplant waiting list continued to decline by 8.8% over the previous year, to 75,745 candidates, the majority of whom were awaiting their first kidney transplant. Case 19 focuses on acute kidney injury (AKI). Critical evaluation of the nutrient and metabolic changes that occur during an AKI and the etiology of laboratory abnormalities is explored. This case allows you to assess intake and output records to determine the need for specialized nutrition support. With AKI being the most common ICU diagnosis, the case demonstrates the critical care assessment skills of practicing RDNs.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 17

Chronic Kidney Disease Treated with Dialysis

Mary Felipe (Acoma Pueblo) is a 24-year-old American Indian who has had type 2 diabetes mellitus since age 16. Mrs. Felipe has experienced a declining glomerular filtration rate for the past two years. She is being admitted in preparation for kidney replacement therapy.

Objectives

After completing this case, the student will be able to:

1. Describe the pathophysiology of chronic kidney disease (CKD).
2. Describe the stages of CKD.
3. Differentiate between the mechanisms of peritoneal dialysis and hemodialysis.
4. Identify and explain common nutritional problems associated with CKD.
5. Interpret laboratory parameters for nutritional implications and significance.
6. Analyze nutrition assessment data to evaluate nutritional status and identify specific nutrition problems.
7. Determine nutrition diagnoses and write appropriate PES statements.
8. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.
9. Integrate sociocultural and ethnic food consumption issues within a nutrition care plan.
10. Make appropriate documentation in the medical record.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Felipe, Mary *Female, 24 y.o.*

Allergies: *NKA*	**Code:** *FULL*	**Isolation:** *None*
Pt. Location: *RM 207*	**Physician:** *L. Nila*	**Admit Date:** *3/5*

iStock.com/Alina555

Patient Summary: Mrs. Felipe (Acoma Pueblo) is a 24-year-old female who was diagnosed with type 2 DM when she was 16 years old and has been poorly compliant with prescribed treatment.

History:

Onset of disease: Diagnosed with Stage 3 chronic kidney disease 2 years ago. Her acute symptoms have developed over the last 2 weeks.
Medical history: Gravida 1/ para 1. Infant weighed 10 lbs at birth 7 years ago. Pt admits she recently stopped taking a prescribed hypoglycemic agent, and she has never filled her prescription for antihypertensive medication. Progressive decompensation of kidney function has been documented by declining GFR, increasing creatinine and urea concentrations, elevated serum phosphate, and normochromic, normocytic anemia. She is being admitted for preparation for kidney-replacement therapy.
Surgical history: No surgeries
Medications at home: Glucophage (metformin), 850 mg twice daily
Tobacco use: No
Alcohol use: Yes, 1–2 12-oz beers daily
Family history: What? T2DM. Who? Parents.

Demographics:

Marital status: Married—lives with husband and daughter; *Spouse name:* Eddie
Number of children: 1
Years education: Associate's degree
Language: English
Occupation: Program coordinator at community college
Hours of work: 9–5
Ethnicity: American Indian
Religious affiliation: Catholic

Admitting History/Physical:

Chief complaint: Pt complains of anorexia; N/V; 4-kg weight gain in the past 2 weeks; edema in extremities, face, and eyes; malaise; progressive SOB with 3-pillow orthopnea; pruritus; muscle cramps; and inability to urinate
General appearance: Overweight female who appears her age; lethargic; complaining of N/V.
HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: oral mucosa pink, dentition in good repair
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.
Cardiac: S4, S1, and S2, regular rate and rhythm. I/VI systolic ejection murmur, upper-left sternal border.
Pulmonary/Chest: Generalized rhonchi with rales that are mild at the bases (Pt breathes with poor effort).
Abdominal: Abdomen soft, mildly tender, with normoactive bowel sounds in all four quadrants. No masses, no organomegaly. No guarding, rebound, or CVA tenderness.
Extremities: Normal range of motion in all four extremities. Muscle weakness; 3+ pitting edema to the knees, no cyanosis.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Felipe, Mary *Female, 24 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 207* **Physician:** *L. Nila* **Admit Date:** *3/5*

Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. Mild asterixis.
Skin: Skin is warm and dry, yellow-tinged. Not diaphoretic. No rashes or ulcerations noted.
Psychiatric: Appropriate mood and affect for clinical situation.

Vital Signs: Temp: 98.6°F Pulse: 86 Resp rate: 25
BP: 220/80 Height: 5'0" Weight: 170 lbs

Nursing Assessment	**3/5**
Abdominal appearance (concave, flat, rounded, obese, distended)	rounded, obese
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	brown
Stool consistency	formed
Tubes/ostomies	N/A
Genitourinary	
Urinary continence	N/A
Urine source	N/A
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	N/A
Integumentary	
Skin color	light brown
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	W
Skin turgor (good, fair, poor, TENT=tenting)	good
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact, A
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N= necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, <12 = high risk)	activity, 16

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Felipe, Mary *Female, 24 y.o.*

Allergies: *NKA*	**Code:** *FULL*	**Isolation:** *None*
Pt. Location: *RM 207*	**Physician:** *L. Nila*	**Admit Date:** *3/5*

Orders:

Evaluate for kidney replacement therapy
Captopril 25 mg twice daily
Erythropoietin (r-HuEPO) 30 units/kg
Sodium bicarbonate 2 g daily
Renal caps—1 daily
Sevelamer carbonate—three times daily with each meal
Doxercalciferol 2.5 pg four times daily 3 times/week
Metformin 850 mg twice daily
35 kcal/kg, 1.2 g protein/kg, 2 g K, 1 g phosphorus, 2 g Na, 1000 mL fluid + urine output per day
CBC, metabolic panel
Stool softener
Occult fecal blood
Nutrition consult

Nutrition:

History: Intake has been poor due to anorexia, N/V. Patient states that she tried to follow the diet that she was taught two years ago. "It went pretty well for a while, but it was hard to keep up with. Basically, I tried to stay away from sweets and salty foods."

Usual dietary intake:

Breakfast:	Cold cereal
	Bread or fried potatoes
	Fried egg (occasionally)
	Bacon or other meat 2–3× per week
	Coffee
Lunch:	Bologna or sub sandwich
	Potato chips
	Coke
Dinner:	Chili con carne
	Fry bread
	Coke
Snacks:	Crackers and peanut butter

Food allergies/intolerances/aversions: None
Previous nutrition therapy? Yes. *If yes, when:* 2 years ago when Pt Dx with Stage 3 chronic kidney disease. *Where?* Indian Health Center—Acoma Service Unit
Current diet: Low simple sugar, 0.8 g protein/kg, 2–3 g Na
Food purchase/preparation: Self
Vit/min intake: None

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Felipe, Mary *Female, 24 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 207* **Physician:** *L. Nila* **Admit Date:** *3/5*

Intake/Output

Date		**3/5 0701–3/6 0700**				**3/6 0701–3/7 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total	0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**0**	**50**	**0**	**50**	**NPO**	**NPO**	**NPO**	**NPO**
	I.V. (mL/kg/hr)								
	I.V. piggyback								
	PN								
	Total intake (mL/kg)	**0** (0)	**50** (0.65)	**0** (0)	**50** (0.65)	**0** (0)	**0** (0)	**0** (0)	**0** (0)
OUT	Urine (mL/kg/hr)	**0** (0)	**100** (0.16)	**0** (0)	**100** (0.05)	**200** (0.32)	**800** (1.29)	**0** (0)	**1000** (0.54)
	Emesis output	**0**	**50**	**0**	**50**	**0**	**100**	**50**	**150**
	Other								
	Stool						×1		
	Total output (mL/kg)	**0** (0)	**150** (1.94)	**0** (0)	**150** (1.94)	**200** (2.59)	**900** (11.65)	**50** (0.65)	**1150** (14.88)
Net I/O		**0**	**−100**	**0**	**−100**	**−200**	**−900**	**−50**	**−1150**
Net since admission (3/5)		**0**	**−100**	**−100**	**−100**	**−300**	**−1200**	**−1250**	**−1250**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Felipe, Mary *Female, 24 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 207* **Physician:** *L. Nila* **Admit Date:** *3/5*

Laboratory Results

	Ref. Range	3/5 0700
Chemistry		
Sodium (mEq/L)	136–145	130 !↓
Potassium (mEq/L)	3.5–5.1	5.8 !↑
Chloride (mEq/L)	98–107	91 !↓
Carbon dioxide (mEq/L)	23–29	32 !↑
Bicarbonate (mEq/L)	23–28	22 !↓
BUN (mg/dL)	6–20	69 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	12.0 !↑
BUN/Crea ratio	10.0–20.0	5.75 !↓
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.1
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	4 !↓
Glucose (mg/dL)	70–99	282 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	6.4 !↑
Magnesium (mg/dL)	1.5–2.4	2.1
Calcium (mg/dL)	8.6–10.2	8.2 !↓
Anion gap (mmol/L)	10–20	17
Osmolality (mmol/kg/H_2O)	275–295	300.3 !↑
Bilirubin, total (mg/dL)	≤1.2	0.9
Bilirubin, direct (mg/dL)	<0.3	0.2
Protein, total (g/dL)	6–7.8	5.9 !↓
Albumin (g/dL)	3.5–5.5	3.3 !↓
Prealbumin (mg/dL)	18–35	27
Ammonia (µg/L)	6–47	8
Alkaline phosphatase (U/L)	30–120	44
ALT (U/L)	4–36	21
AST (U/L)	0–35	16
CPK (U/L)	30–135 F 55–170 M	119
Lactate dehydrogenase (U/L)	208–378	265
Cholesterol (mg/dL)	<200	220 !↑

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Felipe, Mary *Female, 24 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 207* **Physician:** *L. Nila* **Admit Date:** *3/5*

Laboratory Results *(Continued)*

	Ref. Range	3/5 0700
HDL-C (mg/dL)	>50 F, >40 M	72
VLDL (mg/dL)	7–32	36 !↑
LDL (mg/dL)	0–99	111 ↑
LDL/HDL ratio	<4.5	1.54
Triglycerides (mg/dL)	<150	182 !↑
T_4 (µg/dL)	5–12	6.1
T_3 (µg/dL)	75–98	81
HbA_{1C} (%)	<5.7	9.2 !↑
Coagulation (Coag)		
PT (sec)	11–13	12.1
INR	0.9–1.1	0.95
PTT (sec)	24–34	27
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	4.1
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	3.1 !↓
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	10.5 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	33 !↓
Urinalysis		
Collection method	—	Random specimen
Color	—	Straw
Appearance	—	Hazy
Specific gravity	1.001–1.035	1.001
pH	5–7	7.9 !↑
Protein (mg/dL)	Neg	+2 !↑
Glucose (mg/dL)	Neg	+1 !↑

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Felipe, Mary *Female, 24 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 207* **Physician:** *L. Nila* **Admit Date:** *3/5*

Laboratory Results *(Continued)*

	Ref. Range	3/5 0700
Ketones	Neg	+1 !↑
Blood	Neg	Neg
Bilirubin	Neg	Neg
Nitrites	Neg	Neg
Urobilinogen (EU/dL)	<1.0	0.03
Leukocyte esterase	Neg	Neg
Prot chk	Neg	+2 !↑
WBCs (/HPF)	0–5	1
RBCs (/HPF)	0–2	1
Bact	0	0
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0
Arterial Blood Gases (ABGs)		
pH	7.35–7.45	7.44
pCO_2 (mm Hg)	35–45	33 !↓
SO_2 (%)	≥95	97
CO_2 content (mmol/L)	25–30	29
O_2 content (%)	15–22	21
pO_2 (mm Hg)	≥80	91
HCO_3^- (mEq/L)	21–28	20 !↓

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. Describe the basic normal physiological functions of the kidneys.

2. List the diseases/conditions that most commonly lead to chronic kidney disease (CKD). Explain the role of diabetes in the development of CKD.

3. Outline the stages of CKD, including the distinguishing signs and symptoms.

4. From your reading of Mrs. Felipe's history and physical, what signs and symptoms did she have that correlate with her chronic kidney disease?

5. What are the three treatment options for Stage 5 CKD? Explain the differences between hemodialysis and peritoneal dialysis.

II. Understanding the Nutrition Therapy

6. Explain the reasons for the following components of Mrs. Felipe's medical nutrition therapy.

35 kcal/kg:

1.2 g protein/kg:

2 g K:

1 g phosphorus:

2 g Na:

1000 mL fluid + urine output:

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

7. Calculate and interpret Mrs. Felipe's BMI. How does edema affect your interpretation?

8. What is edema-free weight? Calculate Mrs. Felipe's edema-free weight.

9. What are the energy requirements for CKD?

10. Calculate what Mrs. Felipe's energy and protein needs will be once she begins hemodialysis.

11. What are the differences in protein requirements among Stages 1 and 2 CKD, Stages 3 and 4 CKD, hemodialysis, and peritoneal dialysis patients? What is the rationale for these differences?

12. In question 6, you explained why Mrs. Felipe has a PO_4 restriction. List the foods that have the highest levels of phosphorus.

13. Mrs. Felipe tells you that one of her friends can drink only certain amounts of liquids and wants to know if that is the case for her. What foods are considered to be fluids? What fluid restriction is generally recommended for someone on hemodialysis? Is there a standard guideline for maximum fluid gain between dialysis visits? If a patient must follow a fluid restriction, what can be done to help assure adherence and reduce his or her thirst?

14. Several biochemical indices are used to diagnose chronic kidney disease. One is glomerular filtration rate (GFR). What does GFR measure? What is a normal GFR? Interpret Mrs. Felipe's value.

15. Evaluate Mrs. Felipe's chemistry report. What labs are altered due to her diagnosis of Stage 5 CKD?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

16. Which of Mrs. Felipe's symptoms would you expect to begin to improve when she starts dialysis?

17. The following medications were prescribed for Mrs. Felipe. Explain why each was prescribed (the indications/mechanism) and describe any nutritional concerns and dietary recommendations related to the medication.

Captopril:

Erythropoietin:

Sodium bicarbonate:

Renal caps:

Sevelamer carbonate:

Doxercalciferol:

Metformin:

18. Difference in the prevalence of disease can be linked to lifestyle as well as genetic differences.

a. What do we know about the risk of diabetes and chronic kidney disease in the American Indian populations?

b. Diabetes, obesity, and CKD are described as polygenic diseases. Define polygenic.

c. Research has identified numerous single-nucleotide polymorphisms (SNPs) linked to both diabetes and CKD in many American Indian populations. What is a polymorphism? How does a polymorphism potentially occur?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

III. Nutrition Diagnosis

19. Select two nutrition problems and complete the PES statement for each.

IV. Nutrition Intervention

20. For each PES statement, establish an ideal goal (based on the signs and symptoms) and appropriate intervention (based on the etiology).

21. Why is it recommended that patients obtain at least 50% of their protein from sources that have high biological value?

22. What resources and counseling techniques would you use to teach Mrs. Felipe about her diet?

23. A. Based on Mrs. Felipe's energy needs and the fact that she will be starting hemodialysis, plan a 1-day diet using the Renal Exchange List that complies with her diet orders (see question 6).

B. Using Mrs. Felipe's typical intake and the prescribed meal plan above, write a sample menu. Justify your changes—why did you make the change to comply with her nutrition prescription?

Diet PTA		Sample Menu
Breakfast:	Cold cereal (2 c unsweetened)	
	Bread (2 slices) or fried potatoes (1 medium potato)	
	1 fried egg (occasionally)	
	2 cups coffee	
Lunch:	Bologna sandwich (2 slices white bread, 2 slices bologna, mustard)	
	Potato chips (1 oz)	
	1 can Coke	

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

(Continued)

Diet PTA		Sample Menu
Dinner:	Chili con carne (3 oz beef)	
	Fry bread (1 slice, 6" diameter)	
	Iced tea with sugar (16 oz)	
HS Snack:	Crackers (6 saltines) and peanut butter (2 tbsp)	

24. Write an initial ADIME note for your consultation with Mrs. Felipe.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Evidence Analysis Library. Chronic kidney disease (CKD): Executive summary of recommendations (2010). Accessed February 21, 2020.

Academy of Nutrition and Dietetics Nutrition Care Manual. Chronic kidney disease (CKD) stage 5 dialysis. https://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=1&lv1=5537&lv2=255347&ncm_toc_id=255666&ncm_heading=Nutrition%20Care. Accessed February 25, 2020.

Ash S, Campbell KL, Bogard J, Millichamp A. Nutrition prescription to achieve positive outcomes in chronic kidney disease: A systematic review. *Nutrients*. 2014;6:416–451.

Beto JA, Ramirez WE, Bansal VK. Medical nutrition therapy in adults with chronic kidney disease: Integrating evidence and consensus into practice for the generalist registered dietitian nutritionist. *J Acad Nutr Diet*. 2014;114:1077–1087.

Centers for Disease Control. Native Americans with Diabetes. https://www.cdc.gov/vitalsigns/aian-diabetes/index.html. Updated January 10, 2017. Accessed July 15, 2020.

Hansen-Petrick M. Nutritional genomics. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:208–233.

Hanson RL, Muller YL, Kobes S, et al. A genome-wide association study in American Indians implicates DNER as a susceptibility locus for type 2 diabetes. *Diabetes*. 2014;63:369–376.

McCarthy MP, Pavlinac JM, Aoun A. Nutrition intervention part 1: Planning the nutrition prescription. In McCarthy MP, Pavlinac JM, Aoun A, eds. *Chronic Kidney Disease and the Nutrition Care Process.* Chicago, IL: Academy of Nutrition and Dietetics; 2014:92–120.

Nahikian-Nelms M. Diseases of the renal system. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:529–567.

National Kidney Foundation. KDOQI clinical practice guidelines. https://www.kidney.org/professionals/guidelines. Accessed May 10, 2020.

National Kidney Foundation. KDOQI clinical practice guidelines for nutrition in chronic kidney disease: 2019 update. https://www.kidney.org/professionals/kdoqi-guidelines-commentary-nutrition. Unpublished manuscript posted October 2019. Accessed May 10, 2020.

Nahikian-Nelms ML. Nutrition assessment: Foundation of the nutrition care process. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:38–75.

Pronsky ZM, Crowe JP. *Food and Medication Interaction*. 19th ed. Birchrunville, PA: Food-Medication Interactions; 2018.

Yracheta JM, Kabasoa MA, MyPhuong T, et al. Diabetes and kidney disease in American Indians: Potential role of sugar sweetened beverages. *May Clin Proc*. 2015;90:813–823.

Internet Resources

American Association of Kidney Patients: http://www.aakp.org/

Cook's Thesaurus: http://www.foodsubs.com/

Culinary Kidney Cooks: http://www.culinarykidneycooks.com/

eMedicineHealth: http://www.emedicinehealth.com/chronic_kidney_disease/article_em.htm

Indian Health Service. US Department of Health and Human Services: https://www.ihs.gov/

Kidney School: http://kidneyschool.org/

National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK): http://www2.niddk.nih.gov/

National Kidney Foundation Council on Renal Nutrition: http://www.kidney.org/

National Kidney Foundation KDOQI Guidelines: https://www.kidney.org/professionals/guidelines

Nephron Information Center: http://www.nephron.com/

Office of Minority Health. US Department of Health and Human Services: https://minorityhealth.hhs.gov/

Renal Web: http://www.renalweb.com/

United States Renal Data System (USRDS): http://www.usrds.org/

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 18

Chronic Kidney Disease: Peritoneal Dialysis and Renal Transplant

Originally contributed by: Dawn B. Scheiderer, RD, LD—Davita Kidney Care Columbus OH

Mona Caldwell is a 49-year-old female who has a history of membranoproliferative glomerulonephritis. She has had two prevous kidney transplants and is now experiencing acute rejection with chronic allograft nephropathy. Her creatinine level has been rising with worsening of fluid overload. She is admitted to the hospital for further evaluation.

Objectives

After completing this case, the student will be able to:

1. Describe the pathophysiology of chronic kidney disease (CKD).
2. Describe the basic concepts of kidney transplant.
3. Differentiate the physiology of peritoneal dialysis and hemodialysis.
4. Identify and explain common nutritional problems associated with CKD.
5. Interpret laboratory parameters for nutritional implications and significance.
6. Analyze nutrition assessment data to evaluate nutritional status, identify specific nutrition problems, and document corresponding PES statements.
7. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Caldwell, Mona, *Female, 49 y.o.*
Allergies: *Fish* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *789* **Physician:** *K. Wolf* **Admit Date:** *1/21*

iStock.com/Juanmonino

Patient Summary: Patient is a 49-year-old female who has history of membranoproliferative glomerulonephritis resulting in kidney transplant ×2 and is now experiencing acute rejection with chronic allograft nephropathy. She has previously been treated with both hemodialysis and peritoneal dialysis before and between transplants. She is requesting to restart peritoneal dialysis as she would like to continue to work at the U.S. Postal Service. She is admitted for insertion of PD catheter and plans to use cycler at night so that she can continue to work.

History:

Onset of disease: Diagnosed with glomerulonephritis 15 years ago with resulting end-stage renal disease. Initiated hemodialysis at that time and received first transplant one year later. Acute rejection resulted in initiation of peritoneal dialysis. She received second transplant two years ago.
Medical history: Membranoproliferative glomerulonephritis; allograft transplant ×2; hypertension; dyslipidemia; anemia of chronic kidney disease
Surgical history: s/p unilateral oophorectomy; allograft kidney transplant ×2; umbilical hernia repair
Medications at home: Nifedipine, carvedilol, clonidine, mycophenolate mofetil, fish oil, furosemide, prednisone, cyclosporine, lisinopril, sodium bicarbonate, calcitriol, renal caps, sevelamer carbonate
Tobacco use: 1 pack per day, 20 years of use; stopped tobacco use 5–6 years ago
Alcohol use: None
Family history: Mother—cervical cancer; father—lung cancer

Demographics:

Marital status: Married
Years education: 14 years
Language: English only
Occupation: Postal clerk
Hours of work: 8–5
Household members: Lives with husband
Ethnicity: Caucasian
Religious affiliation: None

Admitting History/Physical:

Chief complaint: "They tell me that my transplant is failing—I am very short of breath and I have a lot of fluid—I am here to have a catheter placed so I can start dialysis again."
General: Well-developed, well-nourished 49 y.o. female. No acute distress.
HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: oral mucosa pink, dentition in good repair
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Caldwell, Mona, *Female, 49 y.o.*
Allergies: *Fish* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *789* **Physician:** *K. Wolf* **Admit Date:** *1/21*

Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants. No incisional hernias; signs of prior kidney transplants and umbilical hernia repair noted. No masses, no organomegaly. No guarding, rebound, or CVA tenderness.
Extremities: Normal range of motion in all four extremities. No cyanosis or clubbing 1+ peripheral edema.
Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Skin is warm and dry. Not diaphoretic. No rashes or ulcerations noted.
Psychiatric: Appropriate mood and affect for her clinical situation.

Vital Signs: Temp: 98.4°F Pulse: 62 Resp rate: 12
BP: 161/92 Height: 157.4 cm Weight: 77.1 kg UBW: ~74 kg

Nursing Assessment	**1/22**
Abdominal appearance (concave, flat, rounded, obese, distended)	rounded
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	none
Stool consistency	NA
Tubes/ostomies	NA
Genitourinary	
Urinary continence	yes
Urine source	clean catch
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	cloudy, amber
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	W

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Caldwell, Mona, *Female, 49 y.o.*
Allergies: *Fish* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *789* **Physician:** *K. Wolf* **Admit Date:** *1/21*

Nursing Assessment *(Continued)*

Nursing Assessment	1/22
Skin turgor (good, fair, poor, TENT=tenting)	good
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact, D
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	20

Admission Orders:

Laboratory: CBC, Chemistry
Vital signs: Every 4 hrs
I & O: Recorded every 8 hrs
Diet: 1500 kcal, 75 g pro, 3000 mg Na, 3500 mg K, 1000 mg P, 2000 cc fluid
Activity: Bed rest

Nutrition:

Meal type: 1500 kcal, 75 g pro, 3000 mg Na, 3500 mg K, 1000 mg P, 2000 cc fluid
History: Patient states she has noticed her appetite has not been as good lately. Describes mild nausea but no vomiting. Relates that food has a bad taste. Since her transplant she has only monitored her salt intake—no other restrictions.

24-hour recall:

AM:	Egg McMuffin™, 6 oz orange juice, coffee
Lunch:	Cheeseburger, fries, apple pie, and 12 oz Coke
Dinner:	6 oz roast beef au jus, 3 small oven-browned potatoes, ¼ c broccoli, iced tea, roll with butter

Laboratory Results

	Ref. Range	1/22 0700
Chemistry		
Sodium (mEq/L)	136–145	130 !↓
Potassium (mEq/L)	3.5–5.1	3.8
Chloride (mEq/L)	98–107	99
Carbon dioxide (mEq/L)	23–29	26

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Caldwell, Mona, *Female, 49 y.o.*
Allergies: *Fish* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *789* **Physician:** *K. Wolf* **Admit Date:** *1/21*

Laboratory Results *(Continued)*

	Ref. Range	1/22 0700
BUN (mg/dL)	6–20	124 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	6.8 !↑
BUN/Crea ratio	10.0–20.0	18.2
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.3
Est GFR, Afr-Amer (mL/min/1.73 m^2)	>60	8 !↓
Glucose (mg/dL)	70–99	80
Phosphate, inorganic (mg/dL)	2.2–4.6	11.9 !↑
Magnesium (mg/dL)	1.5–2.4	1.9
Calcium (mg/dL)	8.6–10.2	8.3 !↓
Anion gap (mmol/L)	10–20	6.0 !↓
Osmolality (mmol/kg/H^2O)	275–295	308 !↑
Bilirubin, total (mg/dL)	≤1.2	0.8
Bilirubin, direct (mg/dL)	<0.3	0.1
Protein, total (g/dL)	6–7.8	5.9 !↓
Albumin (g/dL)	3.5–5.5	3.3 !↓
Prealbumin (mg/dL)	18–35	19
Ammonia (µg/L)	6–47	7
Alkaline phosphatase (U/L)	30–120	106
ALT (U/L)	4–36	5
AST (U/L)	0–35	9
CPK (U/L)	30–135 F 55–170 M	35
Lactate dehydrogenase (U/L)	208–378	209
Cholesterol (mg/dL)	<200	154
HDL-C (mg/dL)	>50 F, >40 M	56
VLDL (mg/dL)	7–32	15
LDL (mg/dL)	0–99	83
LDL/HDL ratio	<4.5	1.48

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Caldwell, Mona, *Female, 49 y.o.*
Allergies: *Fish* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *789* **Physician:** *K. Wolf* **Admit Date:** *1/21*

Laboratory Results *(Continued)*

	Ref. Range	1/22 0700
Triglycerides (mg/dL)	<150	77
Coagulation (Coag)		
PT (sec)	11–13	16.9 !↑
INR	0.9–1.1	1.4 !↑
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	8.27
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	2.33 !↓
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	6.6 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	19.0 !↓
Mean cell volume (μm^3)	80–96	65.3 !↓
Mean cell Hgb (pg)	28–32	21.5 !↓
Mean cell Hgb content (g/dL)	32–36	19.5 !↓
RBC distribution (%)	11.6–16.5	16.8 !↑
Transferrin (mg/dL)	250–380 F 215–365 M	219 !↓
Ferritin (mg/mL)	20–120 F 20–300 M	5 !↓

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Caldwell, Mona, *Female, 49 y.o.*
Allergies: *Fish* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *789* **Physician:** *K. Wolf* **Admit Date:** *1/21*

Intake/Output

Date		**1/22 0701–1/23 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**650**	**400**	**750**	**1800**
	I.V. (mL/kg/hr)				
	I.V. piggyback				
	PN				
	Total intake (mL/kg)	**650** (8.43)	**400** (5.19)	**750** (9.73)	**1800** (23.35)
OUT	Urine (mL/kg/hr)	**812** (1.32)	**410** (0.66)	**310** (0.50)	**1532** (0.83)
	Emesis output				
	Other				
	Stool	**×1**	**0**	**0**	**0**
	Total output (mL/kg)	812 (10.53)	410 (5.32)	310 (4.02)	1532 (19.87)
Net I/O		**−162**	**−10**	**+440**	**+268**
Net since admission (1/21)		**−162**	**−172**	**+268**	**+268**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. Describe the major exocrine and endocrine functions of the kidney.

2. What is glomerulonephritis and how can it lead to kidney failure?

3. What laboratory values or other tests support Mrs. Caldwell's diagnosis of chronic kidney disease? List all abnormal values and explain the likely cause for each abnormal value.

4. This patient has had two previous kidney transplants. What are the potential sources for a donor kidney? How is rejection prevented after a kidney transplant? What does it mean when the physician states she is experiencing acute rejection?

5. Based on the admitting history and physical, what signs and symptoms does this patient have that are consistent with acute rejection of the transplant?

6. Mrs. Caldwell has requested that she restart peritoneal dialysis. Briefly describe this medical treatment, including its mechanism, and how it differs from hemodialysis.

II. Understanding the Nutrition Therapy

7. This patient was prescribed the following diet in the hospital:

1500 kcal, 75 g pro, 3000 mg Na, 3500 mg K, 1000 mg P, 2000 cc fluid.

Explain the rationale for each component of her nutrition therapy Rx. How might this change once she has started peritoneal dialysis?

III. Nutrition Assessment

8. Assess Mrs. Caldwell's height and weight. Calculate her BMI and her % usual body weight. How would edema affect your interpretation of this information? Using the KDOQI guidelines, what is Mrs. Caldwell's adjusted body weight?

9. Determine Mrs. Caldwell's energy and protein requirements. Explain the rationale for the method you used to calculate these requirements.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

10. List all medications that Mrs. Caldwell is receiving. Determine the action of each medication and identify any drug–nutrient interactions that you should monitor for.

11. Mrs. Caldwell's laboratory values that you discussed previously in this case indicate she has anemia. Why do renal patients suffer from anemia? How is this typically treated in dialysis patients?

12. What factors in Mrs. Caldwell's history may affect her ability to eat? What are the most likely causes of these symptoms? Is it realistic to expect that they will change?

13. Evaluate Mrs. Caldwell's diet history and 24-hour recall. Is her usual diet consistent with her inpatient diet order?

IV. Nutrition Diagnosis

14. Identify the pertinent nutrition problems.

15. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

16. Mrs. Caldwell was discharged from the hospital and was prescribed the following regimen of peritoneal dialysis to begin at home:

CCPD daily. Ca 2.50; Mg 0.5, Dextrose 2.5%. Total fills (or exchanges) = 3 (3 fills/cycle @ 2500 mL). Total fill volume/24 hours: 7500 mL.

a. Determine the amount of energy that Mrs. Caldwell's PD prescription will provide each day. How will this affect your nutrition recommendations?

b. Using the KDOQI adult guidelines for peritoneal dialysis patients, determine Mrs. Caldwell's nutrition prescription for outpatient use. (Include energy, protein, phosphorus, calcium, potassium, sodium, and fluid.)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

17. Using the identified nutrition problems (and with the understanding that Mrs. Caldwell has received a significant amount of nutrition education in the past), what would you determine to be the most important topics for nutrition education when she returns to the PD clinic?

VI. Nutrition Monitoring and Evaluation

18. List factors that you would monitor to assess Mrs. Caldwell's nutritional status when she returns to the PD clinic.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Nutrition Care Manual. Chronic kidney disease (CKD) stage 5 dialysis. https://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=1&lv1=5537&lv2=255347&ncm_toc_id=255666&ncm_heading=Nutrition%20Care. Accessed February 25, 2020.

Academy of Nutrition and Dietetics Nutrition Care Manual. Kidney transplant. https://www.nutritioncaremanual.org/content.cfm?ncm_content_id=92237&ncm_category_id=1. Accessed February 25, 2020.

Ash S, Campbell KL, Bogard J, Millichamp A. Nutrition prescription to achieve positive outcomes in chronic kidney disease: A systematic review. *Nutrients*. 2014;6:416–451.

Beto JA, Ramirez WE, Bansal VK. Medical nutrition therapy in adults with chronic kidney disease: Integrating evidence and consensus into practice for the generalist registered dietitian nutritionist. *J Acad Nutr Diet*. 2014;114:1077–1087.

Inker LA, Astor BC, Fox CH, et al. KDOQI US commentary on the 2012 KDIGO clinical practice guideline for the evaluation and management of CKD. *Am J Kidney Dis*. 2014;63:713–735.

Kopple JD, Massry SG, eds. *Nutrition Management of Renal Disease*. 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2004.

Luttrell KJ, Beto JA, Tangney CC. Selected nutrition practices of women on hemodialysis and peritoneal dialysis: Observations from the NKF-CRN Second National Research Question Collaborative Study. *J Ren Nutr*. 2014;24:81–91.

McCarthy MP, Pavlinac JM, Aoun A. Nutrition intervention part 1: Planning the nutrition prescription. In McCarthy MP, Pavlinac JM, Aoun A, eds. *Chronic Kidney Disease and the Nutrition Care Process*. Chicago, IL: Academy of Nutrition and Dietetics; 2014:92–120.

Moore L. Implications for nutrition practice in the mineral-bone disorder of chronic kidney disease. *Nutr Clin Pract*. 2011;26:391–400.

Nahikian-Nelms M. Diseases of the renal system. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:529–567.

National Kidney Foundation. KDOQI clinical practice guidelines. https://www.kidney.org/professionals/guidelines. Accessed May 10, 2020.

National Kidney Foundation. KDOQI clinical practice guidelines for nutrition in Chronic Kidney Disease: 2019 update. https://www.kidney.org/professionals/kdoqi-guidelines-commentary-nutrition. Accessed May 10, 2020.

Pronsky ZM, Crowe JP. *Food and Medication Interaction*, 19th ed. Birchrunville, PA: Food-Medication Interactions; 2018.

Skelton SL, Waterman AD, Davis LA, Peipert JD, Fish AF. Applying best practices to designing patient education for patients with end-stage renal disease pursuing kidney transplant. *Prog Transplant*. 2015;25:77–84.

Yilmaz R, Aricic M. How to prepare a chronic kidney disease patient for transplant. In Arici M. *Management of Chronic Kidney Disease, A Clinician's Guide*. Springer; 2014:463–474.

Internet Resources

American Association of Kidney Patients: http://www.aakp.org

AND Evidence Analysis Library: http://www.andeal.org

Drug Bank – Open Data Drug and Drug Target database: http://www.drugbank.ca

International Society for Peritoneal Dialysis: http://www.ispd.org

National Institute of Diabetes and Digestive and Kidney Diseases of the National Institute of Health: http://www.niddk.nih.gov

National Kidney Foundation: http://www.kidney.org

Nutrition Care Manual: http://www.nutritioncaremanual.org

United Network for Organ Sharing. Data: https://unos.org/data/

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 19

Acute Kidney Injury

Randall Maddox is a 67-year-old male admitted for a planned coronary bypass surgery 7 days ago. Postoperatively he experienced respiratory distress and infection, and now his urine output has suddenly decreased. It is now day 7 and a new nutrition consult has been ordered for Mr. Maddox.

Objectives

After completing this case, the student will be able to:

1. Define and describe the classifications of acute kidney injury (AKI) and its potential etiologies.
2. Describe the pathophysiology of AKI.
3. Identify and explain common nutritional problems associated with AKI.
4. Interpret laboratory parameters for nutritional implications and significance.
5. Analyze nutrition assessment data to evaluate nutritional status, identify specific nutrition problems, and document corresponding PES statements.
6. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Maddox, Randall, *Male, 67 y.o.*
Allergies: *Penicillin, sulfa* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *CICU* **Physician:** *C. Taylor* **Admit Date:** *10/8*

iStock.com/Juanmonino

Patient Summary: Patient is a 67-year-old male who is s/p CABG on 10/9. Surgery was successful with 3-vessel bypass. He experienced a hypotensive event in recovery but responded to IV fluids. Further postoperative recovery has been complicated by respiratory distress, subsequent intubation, infection, and need for initiation of propofol.

History:

Onset of disease: Diagnosed with AKI postoperative day 7 (10/16)
Medical history: CAD, s/p MI 15 years ago, hyperlipidemia, and T2DM
Surgical history: s/p 3-vessel CABG 6 days ago
Medications at home: Lovastatin, furosemide, metoprolol
Tobacco use: 2 packs per day, 20 years of use; stopped tobacco use 1 year ago
Alcohol use: Socially
Family history: Mother—diabetes, breast cancer; father—heart disease, lung cancer

Demographics:

Marital status: Divorced; father of 4
Years education: 14+
Language: English only
Occupation: Retired from computer sales
Hours of work: N/A
Household members: Lives by himself
Ethnicity: Caucasian
Religious affiliation: Methodist

MD Progress Note 10/16:

Patient is now POD#7. Experienced continued decrease in urine output: +5295 mL since admission. Urine output last 24 hours: 125 mL.

Vital Signs: Temp: 98.4°F Pulse: 77 Resp rate: 18
BP: 116/88 Height: 6'2" Weight: 225 lbs (admission wt: 208 lbs)

HEENT: Head: WNL
Eyes: PERRLA
Ears: clear
Nose: clear
Throat: dry mucous membranes without exudates or lesions
Cardiac: s/p CABG × 3
Pulmonary/chest: Postoperative atelectasis—encourage aggressive respiratory therapy. Respirations are rapid but clear to auscultation and percussion.
Abdominal: Soft—nt, nd. Tolerated sips of oral intake.
Extremities: Warm with normal pulses
Neurological: Alert and oriented ×3; chronic pain control—scheduled oxycodone
Skin: Cool, pale; peripheral edema noted +3

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Maddox, Randall, *Male, 67 y.o.*
Allergies: *Penicillin, sulfa* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *CICU* **Physician:** *C. Taylor* **Admit Date:** *10/8*

Plan: Continue propofol at 40 mcg/kg/min. Consult: Nephrology for AKI—will begin on CRRT today. Consult: Nutrition for enteral feeding—7 days post-op with negligible nutritional intake.

C. Taylor, MD

Nursing Assessment	10/16
Abdominal appearance (concave, flat, rounded, obese, distended)	obese
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	dark brown
Stool consistency	soft
Tubes/ostomies	NA
Genitourinary	
Urinary continence	catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	cloudy, amber
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	CL
Skin turgor (good, fair, poor, TENT=tenting)	good
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	EC, P
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	13

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Maddox, Randall, *Male, 67 y.o.*
Allergies: *Penicillin, sulfa* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *CICU* **Physician:** *C. Taylor* **Admit Date:** *10/8*

Intake/Output

Date		**10/15 0701–10/16 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**490**	**240**	**0**	**730**
	I.V. (mL/kg/hr)				
	I.V. piggyback				
	PN				
	Total intake (mL/kg)	**490** (5.2)	**240** (2.5)	**0** (0)	**730** (7.7)
OUT	Urine (mL/kg/hr)	**0** (0)	**75** (0.10)	**50** (0.07)	**125** (0.05)
	Emesis output				
	Other				
	Stool	**170**	**0**	**0**	**170**
	Total output (mL/kg)	**170** (1.8)	**75** (0.8)	**50** (0.5)	**295** (3.1)
Net I/O		**+320**	**+165**	**−50**	**+435**
Net since admission (10/8)		**+5180.4**	**+5345.4**	**+5295.4**	**+5295.4**

Laboratory Results

	Ref. Range	**10/21 0600**
Chemistry		
Sodium (mEq/L)	136–145	138
Potassium (mEq/L)	3.5–5.1	5.7 !↑
Chloride (mEq/L)	98–107	102
Carbon dioxide (mEq/L)	23–29	22 !↓
BUN (mg/dL)	6–20	38 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	6.6 !↑
BUN/Crea ratio	10.0–20.0	5.7 !↓
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	4.1
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	8 !↓
Glucose (mg/dL)	70–99	123 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	5.3 !↑

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Maddox, Randall, *Male, 67 y.o.*
Allergies: *Penicillin, sulfa* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *CICU* **Physician:** *C. Taylor* **Admit Date:** *10/8*

Laboratory Results *(Continued)*

	Ref. Range	10/21 0600
Magnesium (mg/dL)	1.5–2.4	2.3
Calcium (mg/dL)	8.6–10.2	8.6
Anion gap (mmol/L)	10–20	20
Osmolality (mmol/kg/H_2O)	275–295	296 !↑
Bilirubin, total (mg/dL)	≤1.2	0.7
Bilirubin, direct (mg/dL)	<0.3	0.29
Protein, total (g/dL)	6–7.8	5.0 !↓
Albumin (g/dL)	3.5–5.5	2.5 !↓
Prealbumin (mg/dL)	18–35	12 !↓
Ammonia (µg/L)	6–47	11
Alkaline phosphatase (U/L)	30–120	141 !↑
ALT (U/L)	4–36	43 !↑
AST (U/L)	0–35	48 !↑
CPK (U/L)	30–135 F 55–170 M	190 !↑
Lactate dehydrogenase (U/L)	208–378	382 !↑
CRP (mg/L)	<1.0	125 !↑
Coagulation (Coag)		
PT (sec)	11–13	14.7 !↑
INR	0.9–1.1	1.3 !↑
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	12.9 !↑
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	2.95 !↓
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	9.1 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	28.6 !↓
Mean cell volume (μm^3)	80–96	94.5
Mean cell Hgb (pg)	28–32	25.9 !↓
Mean cell Hgb content (g/dL)	32–36	19.5 !↓
RBC distribution (%)	11.6–16.5	16.8 !↑

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. Define Mr. Maddox's diagnosis of AKI.

2. What are the risk factors associated with the development of AKI in critically ill adults?

3. Explain the major causes of prerenal, postrenal, and intrarenal/intrinsic AKI. Identify the staging for AKI. What do you suspect is the major etiology of Mr. Maddox's AKI?

4. Explain the major nutrient/metabolic changes (glucose, lipid, protein, and energy expenditure) that may occur during AKI and that would potentially affect your nutrition recommendations.

5. What laboratory values or other tests support Mr. Maddox's diagnosis of AKI? List all abnormal values and explain the likely cause for each abnormal value.

6. Mr. Maddox will be started on continuous renal replacement therapy (CRRT). Describe the basic mechanisms of this therapy.

7. Explain how nutrition therapy recommendations for an AKI patient may differ if he is receiving CRRT versus not receiving any dialysis treatment.

II. Understanding the Nutrition Therapy

8. Mr. Maddox has not eaten since his surgery. He was started on clear liquids several days ago but has taken in very little. Using the ASPEN guidelines, justify his requirement for nutrition support.

III. Nutrition Assessment

9. Assess Mr. Maddox's height, weight, and BMI. What factors from his medical record will affect your interpretation of his weight?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

10. While conducting a nutrition-focused physical examination, the RDN discovers that Mr. Maddox exhibits evidence of temporal wasting and loss of preorbital fat pads, as well as some evidence of triceps fat loss. How might this impact the nutrition recommendations the RDN will make? Describe the etiology of the protein-energy wasting that may occur with AKI.

11. Determine Mr. Maddox's energy and protein requirements. Explain the rationale for the method you used to calculate these requirements.

IV. Nutrition Diagnosis

12. Identify the pertinent nutrition problems.

13. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

14. Outline the appropriate nutrition support plan for Mr. Maddox. Provide recommendations for the nutrition support prescription.

15. Should any micronutrients be supplemented for the AKI patient treated with CRRT? Are there other micronutrients that should be avoided during an episode of AKI treated with CRRT?

VI. Nutrition Monitoring and Evaluation

16. Write your ADIME note to support the nutrition support recommendations.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Nutrition Care Manual. Renal replacement therapy. https://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=1&lv1=5537&lv2=255347&ncm_toc_id=22459&ncm_heading=Nutrition%20Care. Accessed February 27, 2020.

Bellos I, Iliopoulos DC, Perrea DN. Pharmacological interventions for the prevention of acute kidney injury after pediatric cardiac surgery: A network meta-analysis. *Clin Exp Nephrol*. 2019;23(6):782–791.

Bufarah MN, de Góes CR, Cassani de Oliveira M, Ponce D, Balbi AL. Estimating catabolism: A possible tool for nutritional monitoring of patients with acute kidney injury. *J Ren Nutr*. 2017;27(1):1–7.

de Goes CR, Berbel-Bufarah MN, Sanches AC, Xavier PE, Balbi AL, Ponce D. Poor agreement between predictive equations of energy expenditure and measured energy expenditure in critically ill acute kidney injury patients. *Ann Nutr Metab.* 2016;68(4):276–284.

Jonckheer J, Spapen H, Malbrain MLNG, Oschima T, de Waele E. Energy expenditure and caloric targets during continuous renal replacement therapy under reginal citrate anticoagulation. A viewpoint. *Clin Nutr*. 2020;39(2):353–357.

Jonckheer J, Vergaelen K, Spapen H, Malbrain MLNG, de Waele E. Modification of nutrition therapy during continuous renal replacement therapy in critically ill pediatric patients: A narrative review and recommendations. *Nutr Clin Pract*. 2019;34(1):37–47.

Lacey K, Nahikian-Nelms ML. Diseases of the renal system. In Nelms M, Sucher K, Lacey K. *Nutrition Therapy and Pathophysiology.* 3rd ed. Belmont, CA: Cengage Learning; 2016:521–561.

Levey AS, Coresh J, Tighiouart H, Greene T, Inker LA. Measured and estimated glomerular filtration rate: Current status and future directions. *Nat Rev Nephrol*. 2020;16:51–64.

Levey AS, Eckardt KU, Dorman NM, et al. Nomenclature for kidney function and disease: Report of a kidney disease: Improving global (KDIGO) consensus conference. *Kidney Int*. 2020. doi: 10.1016/j.kint.2020.02.010.

Lewicki M, Ng I, Schneider AG. HMG CoA reductase inhibitors (statins) for preventing acute kidney injury after surgical procedures requiring cardiac bypass. *Cochrane Database Syst Rev.* 2015;3:CD010480.

McClave SA, Martindale RG, Vanek VW, et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). *JPEN J Parenter Enteral Nutr*. 2016;40(2):159–211.

Nystrom EM, Nei AM. Metabolic support of the patient on continuous renal replacement therapy. *Nutr Clin Prac.* 2018;33(6):754–766.

Ostermann M, Macedo E, Oudemans-van Straaten H. How to feed a patient with acute kidney injury. *Intens Care Med*. 2019;45:1006–1008.

Sabatino A, Theilla M, Hellerman M, et al. Energy and protein in critically ill patients with AKI: A prospective, multicenter observational study using indirect calorimetry and protein catabolic rate. *Nutrients*. 2017;9(8):E802.

Walker SS, Bonventre JV. Acute kidney injury. In Jameson L, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, eds. *Harrison's Principles of Internal Medicine*. 20th ed. New York, NY: McGraw-Hill; 2018. http://accessmedicine.mhmedical.com/content.aspx?bookid=2129&sectionid-186950567. Accessed February 27, 2020.

Wiesen P, Preiser JC. Nutrition support of critically ill patients with renal failure. In Faber P, Siervo M. *Nutrition in Critical Care*. 1st ed. New York: Cambridge University Press; 2014:163–174.

Internet Resources

American Association of Kidney Patients: http://www.aakp.org

AND Evidence Analysis Library: http://www.andeal.org

Cleveland Clinic Center for Continuing Education: http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/nephrology/acute-kidney-injury/

National Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health: http://www2.niddk.nih.gov/

National Kidney Foundation: http://www.kidney.org

Nutrition Care Manual: http://www.nutritioncaremanual.org

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Eight

NUTRITION THERAPY FOR NEUROLOGICAL DISORDERS

Case 20 addresses neurological conditions through one of the most common diagnoses: stroke. According to the Centers for Disease Control and Prevention, stroke is the fifth leading cause of death in the United States (https://www.cdc.gov/nchs/fastats/stroke.htm, accessed May 17, 2020). The health consequences resulting from stroke are significant and, as in many neurological conditions, may involve impairment in the ability to maintain nutritional status. Symptoms such as impaired vision or ambulation may result in the inability to shop for or prepare adequate meals. Depending on the severity of the stroke, symptoms may interfere with chewing, swallowing, or feeding oneself. These problems are often not easily identified or easily solved. Each situation is highly individualized and requires a comprehensive nutrition assessment. Throughout the course of the disease and rehabilitation, nutrition therapy plays a crucial role in the maintenance of nutritional status and quality of life.

Alzheimer's disease and traumatic brain injury are additional diagnoses for which you will plan nutrition interventions for neurological disease. Consequences of these devastating diseases can interfere with all phases of obtaining, eating, and enjoying food. Interdisciplinary care for a patient with a progressive neurological condition like Alzheimer's disease is crucial for identifying risk of malnutrition at early stages of care and thus improving patient outcomes. Case 21 highlights the roles of the SLP, OT, and nursing in the nutritional management of AD. Instructors can use this case to understand the roles of other professions, promote communication, and enhance patient care. Dysphagia, end-of-life care, and nutrition support ethics are all highlighted. The mini-case associated with Case 21 provides an opportunity to discuss palliative care, hospice, and ethics committees, which are all hospital services that the RDN must be acquainted with to care for those with a terminal illness. This mini-case highlights concepts from each service and pushes the RDN to understand ethics principles as they relate to providing artificial nutrition and hydration to a deteriorating patient with progressive dementia.

Case 22 presents the hypermetabolic state of a neurotrauma. This case also emphasizes interprofessional care and nutrition support. Case 23 explores a pediatric chronic condition—cerebral palsy—and its subsequent nutritional concerns of long-term neurodevelopmental changes.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 20

Ischemic Stroke

Yvette Washington, a 63-year-old woman, is transported to the ED of University Hospital with the following symptoms: slurred speech, numbness on the right side of her face, and weakness of her right arm and leg.

Objectives

After completing this case, the student will be able to:

1. Apply a working knowledge of stroke pathophysiology to the nutrition care process.
2. Analyze nutrition assessment data to establish baseline nutritional status.
3. Identify and explain the role of nutrition support in recovery and rehabilitation from stroke.
4. Assess and identify nutritional risks in dysphagia.
5. Establish the nutrition diagnosis and compose a PES statement.
6. Create strategies to maximize calorie and protein intake.
7. Apply current recommendations for nutritional supplementation and determine appropriate nutrition interventions.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Washington, Yvette, *Female, 63 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 926* **Physician:** *S. Young* **Admit Date:** *8/12*

iStock.com/kali9

Patient Summary: Patient is transported to the ED with right-sided hemiparesis and slurred speech.

History:

Onset of disease: N/A
Medical history: HTN × 10 years, hyperlipidemia × 2 years
Surgical history: Hysterectomy 10 years ago
Medications at home: Captopril 25 mg twice daily; lovastatin 20 mg once daily
Tobacco use: No
Alcohol use: No
Family history: Noncontributory

Demographics:

Marital status: Married—lives with husband; *Spouse name:* Robert
Number of children: Children are grown and do not live at home.
Years education: High school diploma
Language: English only
Occupation: Retired hairdresser
Hours of work: N/A
Ethnicity: African American
Religious affiliation: Protestant—AME

Admitting History/Physical:

Chief complaint: Mr. Washington states that his wife woke up this morning and at first it was a typical day, but by midmorning she had become dizzy and then she couldn't talk or move one side of her body.
General/Constitutional: Well-developed, well-nourished African American female who is unable to speak; unable to move right side.
HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: oral mucosa pink, dentures present
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.
Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants. No masses, no organomegaly. No guarding, rebound, or CVA tenderness.
Extremities: Normal range of motion in all four extremities but with reduced strength, bilaterally. No cyanosis or clubbing or peripheral edema.
Neurological: Conscious; new-onset weakness of the right side involving right arm and leg. Face and arm weakness are disproportionate to leg weakness, and sensation is impaired on the contralateral side. Dysarthria with tongue deviation. Cranial nerves III, V, VII, XII impaired. Motor function tone and strength diminished. Plantar reflex decreased on right side. Blink reflex intact.
Skin: Skin is warm and dry. Patient is not diaphoretic. No rashes or ulcerations noted.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Washington, Yvette, *Female, 63 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 926* **Physician:** *S. Young* **Admit Date:** *8/12*

Vital Signs: Temp: 98.8°F Pulse: 91 Resp rate: 19
BP: 138/88 Height: 5'2" Weight: 158 lbs

Nursing Assessment	8/12
Abdominal appearance (concave, flat, rounded, obese, distended)	rounded, obese
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	incontinent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	brown
Stool consistency	formed
Tubes/ostomies	N/A
Genitourinary	
Urinary continence	catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	yellow
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	CL
Skin turgor (good, fair, poor, TENT=tenting)	fair
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	sensory pressure, 12

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Washington, Yvette, *Female, 63 y.o.*

Allergies: *NKA*	**Code:** *FULL*	**Isolation:** *None*
Pt. Location: *RM 926*	**Physician:** *S. Young*	**Admit Date:** *8/12*

Orders:

Administer 0.6 mg/kg intravenous alteplase/rtPA over one hour with 10% of total dose given as an initial intravenous bolus over one minute. Total dose of 67.5 mg.
Vital signs: q 15 minutes × 2 hours; then q 30 minutes × 6 hours; then q 1 hour × 16 hours.
Neuro checks: Level of consciousness and extremity weakness (use NIHSS scoring):
q 30 minutes × 6 hours, then q 1 hour × 16 hours
IV: 0.9 NS at 75 cc/hr
O_2 at 2 liters/minute via nasal cannula (if needed to keep O_2 sats @95%)
Continuous cardiac monitoring
Strict Intake/Output record
Diet: NPO except medications for 24 hours until dysphagia screening
Noncontrast CT scan
Labs: Chem 16, coagulation times, CBC
Medications: Acetaminophen 650 mg po PRN for pain q 4 to 6 hours
No heparin, warfarin, or aspirin for 24 hours. After 24 hrs: CT to exclude intracranial hemorrhage before any anticoagulants.
Bedside swallowing assessment. Endoscopy with modified barium swallow.
Speech-language pathologist and dietitian to determine staged dysphagia diet after swallowing eval.
Mobility: PT evaluation; OT evaluation

Nutrition:

History: Mr. Washington states that his wife has a good appetite. She has not followed any special diet except for trying to avoid fried foods, and she has stopped adding salt at the table. She made these changes several years ago.

24-hour recall: According to Mr. Washington, his wife ate the following:

AM:	Orange juice—1 c
	Raisin bran—1 c with 6 oz 2% milk
	1 banana
	8 oz coffee with 2 tbsp 2% milk and sweetener
Lunch:	Chicken tortellini soup (cheese tortellini cooked in chicken broth)—2 c
	Saltine crackers—about 8
	Canned pears—2 halves
	6 oz iced tea with sweetener
Dinner:	Fried pork chop—4–6 oz
	Baked sweet potato—1 medium—with 2 tbsp margarine
	Steamed broccoli—approx. 1 c with 1 tsp margarine
	Canned peaches in juice—6–8 slices
	6 oz iced tea with sweetener

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Washington, Yvette, *Female, 63 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 926* **Physician:** *S. Young* **Admit Date:** *8/12*

Food allergies/intolerances/aversions: None
Previous nutrition therapy? No
Current diet: NPO
Food purchase/preparation: Mrs. Washington and spouse
Vit/min intake: Multivitamin/mineral supplement daily, 500 mg calcium 3 × daily

Laboratory Results

	Ref. Range	8/12 1215
Chemistry		
Sodium (mEq/L)	136–145	141
Potassium (mEq/L)	3.5–5.1	3.8
Chloride (mEq/L)	98–107	101
Carbon dioxide (mEq/L)	23–29	27
BUN (mg/dL)	6–20	19
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.2 !↑
BUN/Crea ratio	10.0–20.0	15.8
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.9
Est GFR, Afr-Amer (mL/min/1.73 m^2)	>60	56 !↓
Glucose (mg/dL)	70–99	99
Phosphate, inorganic (mg/dL)	2.2–4.6	4.2
Magnesium (mg/dL)	1.5–2.4	2.1
Calcium (mg/dL)	8.6–10.2	9.2
Osmolality (mmol/kg/H_2O)	275–295	294
Bilirubin, total (mg/dL)	≤1.2	0.9
Bilirubin, direct (mg/dL)	<0.3	0.2
Protein, total (g/dL)	6–7.8	6.3
Albumin (g/dL)	3.5–5.5	4.6
Prealbumin (mg/dL)	18–35	31
Ammonia (µg/L)	6–47	15
Alkaline phosphatase (U/L)	30–120	119
ALT (U/L)	4–36	21
AST (U/L)	0–35	33

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Washington, Yvette, *Female, 63 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 926* **Physician:** *S. Young* **Admit Date:** *8/12*

Laboratory Results *(Continued)*

	Ref. Range	8/12 1215
CPK (U/L)	30–135 F 55–170 M	131
Lactate dehydrogenase (U/L)	208–378	371
Cholesterol (mg/dL)	<200	210 !↑
HDL-C (mg/dL)	>50 F, >40 M	40 !↓
VLDL (mg/dL)	7–32	39 !↑
LDL (mg/dL)	0–99	155 !↑
LDL/HDL ratio	<4.5	3.8
Triglycerides (mg/dL)	<150	198 !↑
HbA_{1C} (%)	<5.7	4.9
Coagulation (Coag)		
PT (sec)	11–13	11.5
INR	0.9–1.1	0.98
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	10.1
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	4.5
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	13.7
Hematocrit (Hct, %)	37–47 F 41–51 M	38.1
Platelet count ($\times 10^3/mm^3$)	150–350	243

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. Define *stroke*. Describe the differences between ischemic and hemorrhagic strokes.

2. The noncontrast CT confirmed that Mrs. Washington had suffered a lacunar ischemic stroke—baseline NIH stroke scale score of 12. What does Mrs. Washington's score for the NIH stroke scale indicate?

3. What factors place an individual at risk for stroke?

4. What specific signs and symptoms noted with Mrs. Washington's exam and history are consistent with her diagnosis? Which symptoms place Mrs. Washington at nutritional risk? Explain your rationale.

5. What is alteplase/rtPA? Why was it administered?

II. Understanding the Nutrition Therapy

6. Define *dysphagia*. What is the primary nutrition implication of dysphagia?

7. Describe the four phases of swallowing:

a. Oral preparation

b. Oral transit

c. Pharyngeal

d. Esophageal

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

8. The International Dysphagia Diet Standardization Initiative defines seven levels of fluid and solid food consistency to be used when planning oral intake for someone with dysphagia. Describe each of these levels of diet modifications.

9. It is determined that Mrs. Washington's dysphagia occurs within the esophageal transit phase and she has reduced esophageal peristalsis. Which IDDSI levels for liquids and solids are appropriate to try with Mrs. Washington?

10. Describe a bedside swallowing assessment. What are the background and training requirements of a speech-language pathologist?

11. Describe a modified barium swallow or fiberoptic endoscopic evaluation of swallowing.

12. Thickening agents and specialty food products are often used to provide texture changes needed for the dysphagia diet. Describe one of these products and how it may be incorporated into the diet.

13. Recent research indicates that providing nutrition support within the first 24–72 hours after a stroke may improve outcomes. Mrs. Washington was not started on any nutrition support. Would you have recommended initiation of nutrition support? Why or why not? What guidelines support your decision?

III. Nutrition Assessment

14. Mrs. Washington's usual body weight is approximately 165 lbs. Calculate and interpret her BMI and her %UBW.

15. Estimate Mrs. Washington's energy and protein requirements. Should weight loss or weight gain be included in this estimation? What is your rationale?

16. Using Mrs. Washington's usual dietary intake, calculate the total number of kilocalories she consumed as well as the energy distribution of kilocalories for protein, carbohydrate, and fat.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

17. Compare the results from question 16 to the nutrient recommendations for an individual with hyperlipidemia and hypertension. Should these recommendations apply for Mrs. Washington during this acute period after her stroke?

18. Estimate Mrs. Washington's fluid needs.

19. Review Mrs. Washington's labs upon admission. Identify any that are abnormal. For each abnormal value, explain the reason for the abnormality and describe the clinical significance and nutritional implications for Mrs. Washington.

IV. Nutrition Diagnosis

20. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

21. For each of the PES statements that you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).

VI. Nutrition Monitoring and Evaluation

22. To maintain or attain normal nutritional status while reducing danger of aspiration and choking, the texture of foods and/or viscosity of fluids are personalized for a patient with dysphagia. Define and give an example of each of the following terms used to describe characteristics of foods/fluids.

Consistency:

Texture:

Viscosity:

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

23. Using Mrs. Washington's 24-hour recall, make suggestions for consistency changes or food substitutions (if needed) to Mrs. Washington and her family.

Orange juice:

Raisin bran:

2% milk:

Banana:

Coffee:

Sweetener:

Chicken tortellini soup:

Saltine crackers:

Canned pears:

Iced tea:

Fried pork chop:

Baked sweet potato:

Steamed broccoli:

Margarine:

Canned peaches:

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

24. Describe Mrs. Washington's potential nutritional problems upon discharge. What recommendations could you make to her husband to prevent each problem you identified? How would you monitor her progress?

25. Would Mrs. Washington be an appropriate candidate for a stroke rehabilitation program? Why or why not?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Nutrition Care Manual. Cerebrovascular disease. https://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=1&lv1=5803&lv2=8233&ncm_toc_id=8233&ncm_heading=Nutrition%20Care. Accessed February 28, 2020.

Academy of Nutrition and Dietetics. International dysphagia diet standardization initiative. https://www.eatrightpro.org/practice/practice-resources/post-acute-long-term-care-management/international-dysphagia-diet-standardization-initiative. Accessed February 28, 2020.

Belafsky P, Kuhn M. The videofluoroscopic swallow study technique and protocol. In Belafsky PC, Kuhn M. *The Clinician's Guide to Swallowing Fluoroscopy*. New York; Springer; 2014:7–13.

Brody RA, Tougher-Decker R, VonHagen S, et al. Role of registered dietitians in dysphagia screening. *J Am Diet Assoc.* 2000;100:1029–1037.

Crary MA, Humphrey JL, Carnaby-Mann G, et al. Dysphagia, nutrition and hydration in ischemic stroke patients at admission and discharge from acute care. *Dysphagia*. 2013;28:69–76.

Dennis M, Lewis S, Cranswick G, Forbes J, FOOD Trial Collaboration. FOOD: A multicentre randomised trial evaluating feeding policies in patients admitted to hospital with a recent stroke. *Health Technol Assess.* 2006;10(2):iii–iv, ix–x, 1–120.

Grise EM, Adeoye O, Lindsell C, et al. Emergency department adherence to American Heart Association guidelines for blood pressure management in acute ischemic stroke. *Stroke*. 2012;43:557–559.

Hankey GJ. The role of nutrition in the risk and burden of stroke: An update of the evidence. *Stroke.* 2017;48:3168–3174.

Hemphill III JC, Greenberg SM, Anderson CS. Guidelines for the management of spontaneous intracerebral hemorrhage: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2015;46:2032–2060.

Hinkle JL. Reliability and validity of the National Institutes of Health stroke scale for neuroscience nurses. *Stroke*. 2014;45:e32–e34.

Johnson S, Brody R, Touger-Decker R, Fleish Marcus A. Knowledge and performance of dysphagia risk screening among registered dietitians in clinical practice. *JAND.* 2014;114(9supp):A26.

McClave SA, Taylor BE, Martindale RG, et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). *J Parenter Enteral Nutr.* 2016;40:159–211.

Paquereau J, Allart E, Romon M, Rousseaux M. The long-term nutritional status in stroke patients and its predictive factors. *J Stroke Cerebrovasc.* 2014;23:1628–1633.

Powers WJ, Rabinstein AA, Ackerson T, et al. Guidelines for the early management of patients with acute ischemic stroke: 2019 update to the 2018 guidelines for the early management of acute ischemic stroke: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke.* 2019;50:e344–e418.

Smith EE, Saver JL, Alexander DN, et al. Clinical performance measures for adults hospitalized with acute ischemic stroke: Performance measures for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2014;45:3472–3498.

Steele CM, Namasivayam-MacDonald AM, Guida BT, et al. Creation and validation of the International Dysphagia Diet Standardisation Initiative Functional Diet Scale. *Arch Phys Med Rehabil.* 2018;99(5):934–944.

Torbey MT, Bosel J, Thoney DH, et al. Evidence-based guidelines for the management of large hemispheric infarction. *Neurocrit Care*. 2015;22:146–164.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. *2015–2020 Dietary Guidelines for Americans.* 8th ed. December 2015. http://health.gov/dietaryguidelines/2015/guidelines. Accessed March 2, 2020.

Virani SS, Alonso A, Benjamin EJ, et al. Heart disease and stroke statistics—2020 update: A report from the American Heart Association. *Circulation.* 2020;141:e139–e596. https://doi/10.1161/CIR.0000000000000757. Accessed July 11, 2020.

Internet Resources

American Speech-Language-Hearing Association: http://www.asha.org

American Stroke Association: A Division of the American Heart Association: http://www.strokeassociation.org

International Dysphagia Diet Standardization Initiative: https://iddsi.org/framework/

National Institute of Neurological Disorders and Stroke: http://www.ninds.nih.gov/disorders/stroke/stroke.htm

NIH Stroke Scale and Scoring: http://www.strokecenter.org/trials/scales/nihss.html

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 21

Progressive Neurological Disease: Alzheimer's Disease

Rose Choleva is a 67-year-old resident at Stanton's long-term care facility with advanced dementia. Her family states that she no longer recognizes her immediate family and is now experiencing incontinence of bowel and bladder, difficulty self-feeding, and weight loss. She was diagnosed with Alzheimer's disease 12 years ago that has rapidly progressed over the last 2 years, requiring continuous care.

Objectives

After completing this case, the student will be able to:

1. Demonstrate a working knowledge of the pathophysiology of Alzheimer's disease and its current medical care.
2. Describe the pharmacotherapy used in Alzheimer's disease.
3. Discuss the current understanding of nutrient supplementation in treatment of Alzheimer's disease.
4. Describe the role of an interdisciplinary team for identifying nutritional health risks in Alzheimer's disease.
5. Analyze nutrition assessment data to evaluate nutritional status, identify specific nutrition problems, and document corresponding PES statements.
6. Use current assessment data to assess for and diagnose malnutrition.
7. Interpret laboratory parameters for nutritional implications and significance.
8. Develop a nutrition care plan—with appropriate measurable goals, interventions, and strategies for monitoring and evaluation—that addresses the nutrition diagnoses of this case.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Choleva, Rose, *Female, 67 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *23B* **Physician:** *B. Rodman*

iStock.com/Morsa Images

Patient Summary: The patient is a 67-year-old female with estimated stage 7 Alzheimer's disease based on the Global Deterioration Scale. She established residency at a long-term care facility 2 years ago following the death of her husband, who was her primary caregiver. During the February family care conference, several concerns were discussed by her interdisciplinary care team. Her family voiced concern with Mrs. Choleva's increased confusion along with her noticeably thin appearance. The SLP confirms a 3-point decline in her MMSE from last year; however, swallow appears to be intact. OT reports regression in toileting mechanics, pocketing of food, and challenges with ability to self-feed. The nurses concur with OT and communicate the need for supervision with all meals. The RDN has been working with the patient consistently and highlights the decline in oral intake.

History:
Onset of disease: Retired 12 years ago with increased concerns of forgetfulness and decreased work productivity
Medical history: Advanced dementia, GERD
Surgical history: Hysterectomy
Medications: Famotidine
Tobacco use: Quit 2 years ago
Alcohol use: None
Family history: Mother—Alzheimer's disease; father—CAD

Demographics:
Marital status: Widowed
Years education: Finished high school
Language: English
Occupation: Retired drugstore assistant
Ethnicity: Caucasian
Religious affiliation: Catholic

Vital Signs: Temp: 98.6°F Pulse: 98 Resp rate: 22
BP: 85/65 Height: 67" Weight: 120 lbs
UBW: 135 lbs (4 months previous)

HEENT: Head: normocephalic; dry, dull hair; sunken cheeks; evidence of temporal wasting
Eyes: anicteric sclera, noninjected conjunctiva; reduced subcutaneous fat within orbital area
Ears: tympanic membranes normal
Nose: dry nasal passageway
Throat: slightly dry mucous membranes without exudates or lesions
Heart: RRR. No gallops or rubs, point of maximal impulse at the fifth intercostal space in the midclavicular line.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Normal bowel sounds—in all regions, without masses or splenomegaly.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Choleva, Rose, *Female, 67 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *23B* **Physician:** *B. Rodman*

Extremities: Reduced strength, evidence of muscle loss in quadriceps and gastrocnemius
Neurological: Bowel and bladder incontinence, increased confusion, unsteady gait, progressive memory loss, aphasic.
Skin: Pallor, dry, poor skin turgor.
Psychiatric: 9 on MMSE; withdrawal from usual activities.

Nursing Assessment	**2/13**
Abdominal appearance (concave, flat, rounded, obese, distended)	flat
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	incontinent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	brown
Stool consistency	hard
Tubes/ostomies	none
Genitourinary	
Urinary continence	no
Urine source	clean catch
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	clear
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	dry
Skin turgor (good, fair, poor, TENT=tenting)	poor
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	EC, D
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact, D
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	9

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Choleva, Rose, *Female, 67 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *23B* **Physician:** *B. Rodman*

Nutrition:

Meal type: Previously regular—now high protein, high calorie
History: Mostly finger foods, because of difficulties with feeding utensils
Usual dietary intake:
Breakfast: dry toast, 2 ounces Boost®
Snack: 2 ounces Boost
Lunch: Pretzels or crackers, half-sandwich with 1 slice cheese and 1 ounce of lunch meat, sips of water
Snack: 2 ounces Boost, crackers
Dinner: chicken fingers—2 pieces, breadstick, sips of water

Intake/Output

Date		**2/13 0701–2/14 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**120**	**200**	**425**	**745**
	I.V. (mL/kg/hr)				
	I.V. piggyback				
	PN				
	Total intake (mL/kg)	**120** (2.2)	**200** (3.7)	**425** (7.8)	**745** (13.7)
OUT	Urine (mL/kg/hr)	**320** (0.73)	**310** (0.71)	**200** (0.46)	**830** (0.64)
	Emesis output				
	Other				
	Stool	**×1**			
	Total output (mL/kg)	**320** (5.9)	**310** (5.7)	**200** (3.7)	**830** (15.2)
Net I/O		**−200**	**−110**	**−225**	**−85**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Choleva, Rose, *Female, 67 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *23B* **Physician:** *B. Rodman*

Laboratory Results

	Ref. Range	2/13 0900
Chemistry		
Sodium (mEq/L)	136–145	143
Potassium (mEq/L)	3.5–5.1	3.9
Chloride (mEq/L)	98–107	103
Carbon dioxide (mEq/L)	23–29	25
BUN (mg/dL)	6–20	22 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.2 !↑
BUN/Crea ratio	10.0–20.0	18.3
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	3.3
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	55 !↓
Glucose (mg/dL)	70–99	75
Phosphate, inorganic (mg/dL)	2.2–4.6	2.8
Magnesium (mg/dL)	1.5–2.4	1.7
Calcium (mg/dL)	8.6–10.2	8.4 !↓
Osmolality (mmol/kg/H_2O)	275–295	297 !↑
Bilirubin, total (mg/dL)	≤1.2	0.8
Bilirubin, direct (mg/dL)	<0.3	0.1
Protein, total (g/dL)	6–7.8	5.1 !↓
Albumin (g/dL)	3.5–5.5	2.4 !↓
Prealbumin (mg/dL)	18–35	16.5 !↓
Ammonia (µg/L)	6–47	11
Alkaline phosphatase (U/L)	30–120	55
ALT (U/L)	4–36	29
AST (U/L)	0–35	20
CPK (U/L)	30–135 F 55–170 M	91
Lactate dehydrogenase (U/L)	208–378	287
Cholesterol (mg/dL)	<200	125
HDL-C (mg/dL)	>50 F, >40 M	52

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Choleva, Rose, *Female, 67 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *23B* **Physician:** *B. Rodman*

Laboratory Results *(Continued)*

	Ref. Range	2/13 0900
VLDL (mg/dL)	7–32	16
LDL (mg/dL)	0–99	90
LDL/HDL ratio	<4.5	1.73
Triglycerides (mg/dL)	<150	130
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	10.1
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	3.7 !↓
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	10.2 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	31.5 !↓
Transferrin (mg/dL)	250–380 F 215–365 M	390 !↑
Ferritin (mg/mL)	20–120 F 20–300 M	14 !↓
Total iron binding capacity (mg/dL)	240–460	468 !↑

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. Describe our current understanding of the pathophysiology of Alzheimer's disease. Include the role that genetics may play in the development of disease.

2. How does this pathophysiology translate into the signs and symptoms of Alzheimer's disease? Which signs and symptoms contribute to nutritional risk? Are any of these signs and symptoms noted in Mrs. Choleva's history and physical?

3. Various staging models are used to classify Alzheimer's disease. Describe the Global Deterioration Scale and the clinical description of Alzheimer's disease that is associated with each stage. What signs/symptoms is Mrs. Choleva experiencing that are consistent with her stage of disease?

4. Explain the role of the central nervous system in the regulation of thirst. How does this change during the aging process? How might risk of dehydration be further exacerbated in Alzheimer's disease?

5. Mrs. Choleva was being treated with donepezil 6 years ago, which has since been discontinued after experiencing an adverse side effect. Prior to starting this medication her MMSE was 12 and increased to 16. What is the role of donepezil in the treatment of Alzheimer's disease? How does this compare to the use of memantine?

II. Understanding the Nutrition Therapy

6. Management of Alzheimer's disease requires an interdisciplinary approach. Describe the role of the SLP and OT in the nutritional management of Mrs. Choleva.

7. The SLP and nursing staff have identified Mrs. Choleva pocketing her food in her cheeks. How might this impact the RDN's nutrition recommendations?

8. Mrs. Choleva is experiencing disinterest in food. Describe three tactics the RDN can use to increase oral intake.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

9. If Mrs. Choleva's oral intake continues to be poor, what is the role of nutrition support in advanced Alzheimer's disease?

10. What is the role of omega-3 fatty acids, B vitamins and vitamins C and E in the pathology of Alzheimer's disease? Describe the evidence for providing supplementation of these nutrients.

III. Nutrition Assessment

11. Evaluate Mrs. Choleva's weight by calculating her BMI and %UBW.

12. After examining Mrs. Choleva's history and physical, identify any clinical signs and symptoms that may alert you to a nutrient deficiency. Describe the nutrition-focused physical examination and address the important components that may be used to fully assess Mrs. Choleva's nutritional status.

13. Evaluate Mrs. Choleva's laboratory values. List all abnormal values and explain the likely cause for each abnormal value.

14. Determine Mrs. Choleva's energy and protein requirements. Explain the rationale for the method you used to calculate these requirements.

15. Assess Mrs. Choleva's typical dietary intake. Compare her energy and protein intakes to her estimated nutrient needs.

IV. Nutrition Diagnosis

16. What benchmarks would you assess to determine if Mrs. Choleva meets the criteria for malnutrition using the proposed definitions of malnutrition associated with chronic disease?

17. Identify two pertinent nutrition problems.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

18. Write your PES statement for each nutrition problem.

V. Nutrition Intervention

19. Dysphagia is a common complication associated with feeding complications in Alzheimer's disease. Discuss the International Dysphagia Diet Standardization Initiative and the framework used to identify food and liquid descriptions.

20. Using the data collected during your nutrition assessment, what vitamin and mineral supplementation would you recommend?

21. Describe the ethical dilemma for providing artificial nutrition and hydration (ANH) in a patient with Alzheimer's disease. Does Mrs. Choleva meet the criteria for initiation of ANH?

22. Compare and contrast the strengths and limitations of the use of oral nutrition supplements (i.e., Boost) versus enteral nutrition therapy in advanced Alzheimer's disease.

VI. Nutrition Monitoring and Evaluation

23. Identify factors that you will need to monitor to ensure adequacy of Mrs. Choleva's nutrition intervention.

24. Describe the monitoring and evaluation plan for all micronutrient supplements that are recommended for Mrs. Choleva.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Abate G, Marziano M, Rngratanawanich MM, et al. Nutrition and AGE-ing: Focusing on Alzheimer's disease. *Oxid Med and Cell Longev*. 2017;1–10.

Abbatrcola AM, Russo M, Barieri M. Dietary patterns and cognition in older persons. *Curr Opin Clin Nutr Metab Care*. 2018;21:10–13.

Academy of Nutrition and Dietetics. Position of the Academy of Nutrition and Dietetics: Food and nutrition for older adults: Promoting health and wellness. *J Am Diet Assoc*. 2012;112(8):1255–1277.

Academy of Nutrition and Dietetics. Position of the Academy of Nutrition and Dietetics and the Society for Nutrition Education and Behavior: Food and nutrition programs for community-residing older adults. *J Am Diet Assoc*. 2019;119(7):1188–1204.

Alzheimer's Association. *2019 Alzheimer's Disease Facts and Figures.* Chicago, IL: Alzheimer's Association; 2018. https://www.alz.org/alzheimers-dementia/facts-figures. Accessed March 5, 2020.

Barrocas A, Geppert C, Durfee SM, et al. A.S.P.E.N. ethics position paper. *Nutr Clin Prac*. 2010;25(6):672–679.

Fuhrman MP. Nutrition support at the end of life: A critical decision. *Today's Dietitian*. 2008;10(9):68.

Gómez-Gómez ME, Zapico SC. Frailty, cognitive decline, neurodegenerative diseases and nutrition interventions. *Int J Mol Sci*. 2019;20(11):E2842.

Grand JHG, Caspar S, MacDonald SWS. Clinical features and multidisciplinary approaches to dementia care. *J Multidiscp Healthc*. 2011;4:125–147.

Grimm MO, Michaelson DM, Hartmann T. Omega-3 fatty acids, lipids, and apoE lipidation in Alzheimer's disease: A rationale for multi-nutrient dementia prevention. *J Lipid Res*. 2017;58:2083–2101.

Lauriola M, Mangiacotti A, D'Onofrio G, et al. Neurocognitive disorders and dehydration in older patients: Clinical experience supports the hydromolecular hypothesis of dementia. *Nutrients*. 2018;10(5):562.

Meier CA, Ong TD. To feed or not to feed? A case report and ethical analysis of withholding food and drink in a patient with advanced dementia. *J Pain and Symptom Manag*. 2015;50(6):887–890.

Muñoz Fernández S, Lima Ribeiro SM. Nutrition and Alzheimer's disease. *Clin Geriatr Med*. 2018;34:677–697.

Nahikian-Nelms MN. Diseases and disorders of the neurological system. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:603–640.

National Institute on Aging. Alzheimer's disease fact sheet. https://www.nia.nih.gov/health/alzheimers-disease-fact-sheet. Accessed March 5, 2020.

Palese A, Valentina B, Hayter M, et al. Enhancing independent eating among older adults with dementia: A scoping review of the state of the conceptual and research literature. *BMC Nurs*. 2020;19:32.

Reisberg B, Ferris SH, de Leon MJ, et al. The global deterioration scale for assessment of primary degenerative dementia. *Am J Psychiatry*. 1982;139:1136–1139.

Santos TBND, Fonseca LC, Tedrus GMAS, et al. Alzheimer's disease: Nutritional status and cognitive aspects associated with disease severity. *Nutr Hosp*. 2018;35(6):1298–1304.

Solfrizzi V, Custodero C, Lozupone M, et al. Relationships of dietary patterns, foods, and micro- and macronutrients with Alzheimer's disease and late-life cognitive disorders: A systematic review. *J Alzheimer's Dis*. 2017;59(3):815–849.

Tombini M, Sicari M, Pellegrino G, et al. Nutritional status of patients with Alzheimer's disease and their caregivers. *J Alzheimer's Dis*. 2016;54:1619–1627.

Vincente DO, Soares GR, Sousa AS, et al. Impact of nutrition supplementation and a psychomotor program on patients with Alzheimer's disease. *Am J Alzheimers Dis Other Demen*. 2017;32:329–341.

Wlodarek D. Role of the ketogenic diet in neurodegenerative diseases (Alzheimer's disease and Parkinson's disease). *Nutrients*. 2019;11(1):E169.

Internet Resources

Alzheimer's Association: https://www.alz.org/

American Society for Parenteral and Enteral Nutrition Support and Ethics Toolkit: http://www.nutritioncare.org/Guidelines_and_Clinical_Resources/Toolkits/Nutrition_Support_and_Ethics_Toolkit/

Mayo Clinic. Alzheimer's disease: https://www.mayoclinic.org/diseases-conditions/alzheimers-disease/symptoms-causes/syc-20350447

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 22

Young Adult Traumatic Brain Injury

Ryan Walker is a 25-year-old male admitted through the ED after an MVC collision with a tree.

Objectives

After completing this case, the student will be able to:

1. Describe the pathophysiology of traumatic brain injury.
2. Describe the metabolic response to stress and trauma.
3. Determine nutrient, fluid, and electrolyte requirements for a critically ill patient.
4. Evaluate nutrition assessment data to determine nutritional status and identify specific nutrition problems.
5. Determine nutrition diagnoses and write appropriate PES statements.
6. Use evidence-based guidelines to design an enteral nutrition support plan.
7. Determine steps to monitor and evaluate enteral nutrition support and the transition to an oral diet.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Walker, Ryan, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *SICU Bed #1* **Physician:** *L. King* **Admit Date:** *6/6*

eurobanks/Shutterstock.com

Patient Summary: Ryan Walker is a 25-year-old male admitted through the ED after a motor vehicle collision with a tree. Last pm, 911 call indicated that a 25 y.o. white male swerved to miss a deer crossing the highway, lost control of his vehicle, and hit a guardrail, where a tree stopped his trajectory. Mr. Walker was using a lap/shoulder belt, the air bag was deployed, and he was unconscious at the scene with unstable vitals. He was transported via Lifeflight to University Hospital.

History:

Onset of disease: Mr. Walker, restrained single driver in MVC with deer at 8:00 p.m. tonight. Intubated in ED emergently. He is transferred to SICU from the ED after stabilization.
Medical history: No significant medical history
Surgical history: Appendectomy age 20
Medications at home: None
Tobacco use: Nonsmoker
Alcohol use: Social drinker per family—2–3 drinks per week
Family history: Mother—breast cancer; father—hypertension, hyperlipidemia; brother (age 14)—acute lymphocytic leukemia, now in remission

Demographics:

Marital status: Single
Years education: 16 years—BS: mechanical engineering
Language: English, Spanish
Occupation: Engineer—Bismarck Airline Corporation
Hours of work: 9–5
Household members: Lives with roommate
Ethnicity: Caucasian
Religious affiliation: None

Admitting History/Physical:

Chief complaint: Patient is alternating between moaning and unconsciousness.
General appearance: Multiple lacerations on head, face, arms, legs.

Vital Signs:

Temp: 100.5°F	Pulse: 105	Resp rate: 26
BP: 90/70	Height: 5'11"	Weight: 172 lbs

General/Constitutional: Well developed, well nourished. In acute distress.
HEENT: Head: multiple lacerations head, face, and neck. Normocephalic.
Eyes: anicteric sclera, noninjected conjunctiva. Pupils 4 mm reactive—opens to painful stimuli.
Mouth: bloody, loss of lower-right incisor
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Walker, Ryan, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *SICU Bed #1* **Physician:** *L. King* **Admit Date:** *6/6*

Cardiac: Elevated rate and normal rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Intubated in ED.
Abdominal: Abdomen soft, nontender, with hypooactive bowel sounds in all four quadrants. No masses, no organomegaly. No guarding, rebound, or CVA tenderness.
Extremities: Flexion withdrawal from painful stimuli. Lacerations on both knees. No cyanosis or clubbing or peripheral edema.
Neurological: GCS = 8 E2 V2 M4. Withdrawal and moaning when touched. Some incomprehensible words.
Skin: Skin is warm and dry. Is not diaphoretic. Multiple abrasions and bruising.

Orders:
Neuro checks q hour; position HOB 30 degrees or greater.
Vital signs every hour—maintain systolic blood pressure greater than 180 or less than 90; diastolic blood pressure greater than 100 or less than 60; heart rate greater than 110 or less than 60; respiratory rate greater than 24 or less than 10; temperature greater than 101.5°F; SaO_2 less than 92%.
Cardiac monitoring
Continuous pulse oximetry
Intake/output
Weigh daily
Oral care per ventilator protocol
Arterial line care per protocol
Sedation dose titration—follow unit ICU sedation protocol for mechanical ventilation. If sedation weaning/interruption is not performed, document contraindications in patient chart.
Blood glucose every 6 hours—if any blood glucose is greater than 300 mg/dL, then repeat blood glucose (POC device) in 2 hours. If the initial blood glucose was greater than 300 mg/dL and if the second blood glucose is greater than 200 mg/dL, then notify house officer.

Medications: Propofol 30 mcg/kg/min
Fentanyl 25 mcg/hr
Cefazolin in 0.9% sodium chloride—2 g
Hydromorphone 0.5–1 mg every four hours
4 g calcium gluconate, 4 g magnesium sulfate in 0.9% sodium chloride 75 mL/hr
Tetanus and diphtheria toxoids vaccine injection 0.5 mL

Department of Radiology—CT Report
Date: 6/6
Patient: Ryan Walker
Physician: L. King, MD
Two areas of increased density in L frontal lobe near vertex and possibly left central modality.
Victoria Roundtree, MD, Dept. of Radiology

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Walker, Ryan, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *SICU Bed #1* **Physician:** *L. King* **Admit Date:** *6/6*

Department of Radiology—MRI Report

Date: 6/6
Patient: Ryan Walker
Physician: L. King, MD
MRI showed areas of hemorrhagic edema in deep white matter of L frontal lobe anteriorly. Additionally, heme and edema found in the splenium of corpus callosum.
3.4 cm × 4.2 cm × 1.0 cm representing areas of shearing injury.
H. Loews, MD, Dept. of Radiology

Nursing Assessment	**6/6**
Abdominal appearance (concave, flat, rounded, obese, distended)	flat
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	incontinent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	light brown
Stool consistency	soft
Tubes/ostomies	Foley catheter in place
Genitourinary	
Urinary continence	catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	cloudy, hematuria
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	W
Skin turgor (good, fair, poor, TENT=tenting)	good
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	EC, A
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	13

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Walker, Ryan, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *SICU Bed #1* **Physician:** *L. King* **Admit Date:** *6/6*

Nutrition:

Meal type: NPO
History: Family indicates that patient is a lacto-ovo-vegetarian and has always been very health-conscious.
AM: Smoothie made with whey protein, Greek yogurt, 1–2 fruits and 1–2 vegetables
Lunch: Eats in work cafeteria—salad with some tofu, nuts, and cheese; bread or crackers
Dinner: Usually cooks—likes all vegetables, fruits, grains, nuts, eggs, and dairy products. Does eat out some days—likes all kinds of ethnic foods—Greek, Indian, Chinese, Mexican, Thai.

MD Progress Note:

6/8 0750
Subjective: Previous 24 hours reviewed. Stable overnight.
Nasogastric tube placed for enteral feeding. ICP WNL.
Vitals: Temp: 99.6°F, Pulse: 83, Resp rate: 33, BP: 129/92, Wt. 79.2 kg
Urine output: 3720 mL (46.9 mL/kg)

Physical Exam
General: MRI showed areas of hemorrhagic edema in deep white matter of L frontal lobe anteriorly. Additionally, heme and edema found in the splenium of corpus callosum. 3.4 cm × 4.2 cm × 1.0 cm representing areas of shearing injury. Continues to arouse easily. One-level commands followed. Oriented to family but not place or time.
Neck: WNL
Heart: WNL
Lungs: Clear to auscultation
Abdomen: Active bowel sounds

Assessment/Plan:

Dx: Traumatic brain injury secondary to MVA collision—GCS = 8 E2 V2 M4.
Plan: PT, OT consult. Begin attempts to wean from ventilator—consult for spontaneous breathing trial. Nutrition consult for enteral feeding.

..... *L. King, MD*

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Walker, Ryan, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *SICU Bed #1* **Physician:** *L. King* **Admit Date:** *6/6*

Intake/Output

Date		**6/6 1900–6/7 0700 78.1 kg**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**0**	0	0	0
	I.V. (mL/kg/hr)			600 (0.96)	600 (0.96)
	I.V. piggyback			150	
	PN			0	
	Total intake (mL/kg)			750 (9.6)	750 (9.6)
OUT	Urine (mL/kg/hr)			450 (0.72)	450
	Emesis output			**0**	
	Other			**0**	
	Stool			**0**	
	Total output (mL/kg)			**450** **(5.76)**	**450** **(5.76)**
Net I/O				+300	+300
Net since admission (6/6)				+300	+300

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Walker, Ryan, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *SICU Bed #1* **Physician:** *L. King* **Admit Date:** *6/6*

Intake/Output

Date		**6/7 0700–6/8 0700 79.2 kg**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	0	0	0	0
	I.V.	600	600	600	1800
	(mL/kg/hr)	(0.94)	(0.94)	(0.94)	(0.94)
	I.V. piggyback		300		
	Enteral feeding		150	400	650
	Total intake	600	1050	1000	2450
	(mL/kg)	(7.57)	(13.2)	(12.6)	(30.93)
OUT	Urine	710	1300	1500	3510
	(mL/kg/hr)	(1.12)	(2.05)	(2.36)	(1.84)
	Emesis output	**0**	**0**	**0**	**0**
	NG to suction	**50**	**120**	**40**	**210**
	Stool	**0**	**0**	**0**	**0**
	Total output	**760**	**1420**	**1540**	**3720**
	(mL/kg)	**(9.5)**	**(17.9)**	**(19.4)**	**(46.9)**
Net I/O		−160	−370	−540	−1270
Net since admission (6/6)					−770

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Walker, Ryan, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *SICU Bed #1* **Physician:** *L. King* **Admit Date:** *6/6*

Laboratory Results

	Ref. Range	6/6 1615	6/7 0600
Chemistry			
Sodium (mEq/L)	136–145	137	135
Potassium (mEq/L)	3.5–5.1	3.8	3.7
Chloride (mEq/L)	98–107	101	99
Carbon dioxide (mEq/L)	23–29	29	27
BUN (mg/dL)	6–20	19	18
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	0.96	1.0
BUN/Crea ratio	10.0–20.0	20	18
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	6.1	
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	109	104
Glucose (mg/dL)	70–99	97	125 !↑
Lactate (mmol/L)	0.50–1.60	2.77 !↑	2.8 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	2.5	2.1 !↓
Magnesium (mg/dL)	1.5–2.4	1.6	1.4 !↓
Calcium (mg/dL)	8.6–10.2	8.6	8.4
Anion gap (mmol/L)	10–20	8.0 !↓	
Osmolality (mmol/kg/H_2O)	275–295	286	283
Bilirubin, total (mg/dL)	≤1.2	0.9	1.1
Bilirubin, direct (mg/dL)	<0.3	0.1	0.2
Protein, total (g/dL)	6–7.8	6.5	6.1
Albumin (g/dL)	3.5–5.5	4.6	3.7
Prealbumin (mg/dL)	18–35	33	21
Ammonia (µg/L)	6–47	21	19
Alkaline phosphatase (U/L)	30–120	141 !↑	145 !↑
ALT (U/L)	4–36	18	22
AST (U/L)	0–35	23	24
CPK (U/L)	30–135 F 55–170 M	220 !↑	235 !↑
Lactate dehydrogenase (U/L)	208–378	210	175
C-reactive protein (mg/dL)	<1.0	145 !↑	155 !↑

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Walker, Ryan, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *SICU Bed #1* **Physician:** *L. King* **Admit Date:** *6/6*

Laboratory Results *(Continued)*

	Ref. Range	6/6 1615	6/7 0600
Coagulation (Coag)			
PT (sec)	11–13	12.1	12.7
INR	0.9–1.1	1.0	0.9
PTT (sec)	24–34	25	26
Hematology			
WBC ($\times 10^3/mm^3$)	3.9–10.7	7.9	12.1 !↑
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	4.55	3.9 !↓
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	14.0	13.1 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	41.2	39 !↓
Mean cell volume (μm^3)	80–96	90.4	91
Mean cell Hgb (pg)	28–32	31.1	30
Mean cell Hgb content (g/dL)	32–36	34.1	33
RBC distribution (%)	11.6–16.5	12.7	11.7
Platelet count ($\times 10^3/mm^3$)	150–350	175	184
Transferrin (mg/dL)	250–380 F 215–365 M	304	310
Hematology, Manual Diff			
Neutrophil (%)	40–70	57	73 !↑
Lymphocyte (%)	22–44	33.8	37
Monocyte (%)	0–7	7.8 !↑	8.1 !↑
Eosinophil (%)	0–5	0.8	1.0
Basophil (%)	0–2	0.6	0.7
Blasts (%)	3–10	3.7	3.1
Segs (%)	0–60	21	19
Bands (%)	0–10	3	12 !↑
Urinalysis			
Collection method	—	catheter	
Color	—	yellow	
Appearance	—	cloudy	
Specific gravity	1.001–1.035	1.007	

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Walker, Ryan, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *SICU Bed #1* **Physician:** *L. King* **Admit Date:** *6/6*

Laboratory Results *(Continued)*

	Ref. Range	6/6 1615	6/7 0600
pH	5–7	5.67	
Protein (mg/dL)	Neg	Neg	
Glucose (mg/dL)	Neg	Neg	
Ketones	Neg	Neg	
Blood	Neg	+ !↑	
Bilirubin	Neg	Neg	
Nitrites	Neg	Neg	
Urobilinogen (EU/dL)	<1.0	0.12	
Leukocyte esterase	Neg	Neg	
Prot chk	Neg	Neg	
WBCs (/HPF)	0–5	3	
RBCs (/HPF)	0–2	4 !↑	
Bact	0	0	
Mucus	0	0	
Crys	0	0	
Casts (/LPF)	0	0	
Yeast	0	0	
Arterial Blood Gases (ABGs)			
pH	7.35–7.45	7.37	7.39
pCO_2 (mm Hg)	35–45	41.8	42
SO_2 (%)	≥95	98	97
CO_2 content (mmol/L)	25–30	29.4	28.1
O_2 content (%)	15–22	18	19
pO_2 (mm Hg)	≥80	452.9 !↑	310 !↑
HCO_3^- (mEq/L)	21–28	23.7	24

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. Define traumatic brain injury (TBI). What is the Glasgow coma scale? What was Mr. Walker's GCS score? What findings from the physical exam are consistent with this score?

2. Read the radiology reports and the MD progress note dated 6/8. What causes edema and bleeding after a TBI? What general functions occur in the frontal lobe? How might Mr. Walker's injury affect him in the long term?

3. Secondary effects for this type of injury result from the complications initiated by the injury and may occur over days following the insult. These may include the following: inflammatory response, oxidative stress, ischemia, hypoxia, and increased intracranial pressure. Discuss three of these complications and how they may impact Mr. Walker's hospitalization and recovery.

II. Understanding the Nutrition Therapy

4. Head trauma patients are significantly catabolic. Describe this acute metabolic response to injury.

5. Using the ASPEN and/or AND evidence-based guidelines, describe the role of nutrition support in the care of the TBI patient.

6. Are there specific nutrients that are recommended to support the care of the patient with a TBI?

III. Nutrition Assessment

7. Assess Mr. Walker's admitting height and weight. Calculate and evaluate his BMI.

8. Determine Mr. Walker's energy, protein, and fluid requirements. Provide a rationale for the method you have used to estimate his needs.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

9. Mr. Walker was started on Pivot 1.5 @ 50 mL/hr. How much energy and protein will this provide? Does it meet his estimated protein and energy needs that you determined in question 8?

10. Using the intake/output information for 6/7–6/8, answer the following:

a. What was the total volume of feeding for 6/7–6/8?

b. What was the nutritional value of his feeding? Calculate the total energy and protein that he received.

c. What percentage of his needs was met? What factors may interfere with the patient receiving his prescribed nutrition support? What steps can be made to assure adequate delivery of nutrition support to the critically ill patient?

11. Assess Mr. Walker's laboratory values at admission and on 6/7. Explain any abnormal laboratory values.

IV. Nutrition Diagnosis

12. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

13. Mr. Walker's MD started enteral feeding on day 2 of the admission. As the RD in the neurointensive care unit, outline the complete nutrition support recommendations you would make for Mr. Walker.

14. Mr. Walker has received propofol (Diprivan) 25 mcg/kg/min or 8.2 mL/hr. What is propofol? How many kcal would he receive from this prescription?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

VI. Nutrition Monitoring and Evaluation

15. Mr. Walker was extubated on day 4 of his admission. He received a swallowing evaluation that is described in the following report:

Department of Speech Pathology:

RE: Interpretation of FEES/Swallowing Evaluation—Ryan Walker

Date: 6/10

Patient, Ryan Walker, accepted applesauce with appropriate tongue lateralization and chewing skills but choked when offered 2–3 sips of water. Oral skills appropriate. Showed significant signs of fatigue and decreased cooperation after a few swallows, which inhibited PO feeding. No evidence of penetration or aspiration. Recommend to retry evaluation in 2–3 days.

C. Davie, MS, SLP

What is an FEES? What factors in the speech pathologist's report indicate the continued need for enteral feeding?

16. When Mr. Walker is cleared for an oral diet by the SLP and physician, what information would you use to determine the appropriate oral diet order? What guidelines would you use to determine when Mr. Walker can be weaned from his enteral feeding?

17. Mr. Walker will be transferred to the rehabilitation unit in the hospital for therapies with physical therapy, occupational therapy, and speech therapy. Summarize the training for each of these professionals and describe their potential role in Mr. Walker's recovery. How might the RDN interact with the treatment team to support therapies for his recovery?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Abdelmalik PA, Draghic N, Ling GSF. Management of moderate and severe traumatic brain injury. *Transfusion*. 2019;59:1529–1538.

Academy of Nutrition and Dietetics Nutrition Care Manual. Critical illness. https://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=1&lv1=37030&ncm_toc_id=37030&ncm_heading=Nutrition%20Care. Accessed March 5, 2020.

Ashcraft CM, Frankenfield DC. Energy expenditure during barbiturate coma. *Nutr Clin Pract.* 2013;28:603–608.

Bistrian BR, Askew W, Erdman JW, Oria MP. Nutrition and traumatic brain injury: A perspective from the Institute of Medicine report. *J Parenter Enteral Nutr*. 2011;35:556–559.

Carney N, Totten AM, O'Reilly C, et al. Guidelines for the management of severe traumatic brain injury, fourth edition. *Neurosurgery.* 2017;80(1):6–15.

Chapple LS, Deane AM, Heyland DK, et al. Energy and protein deficits throughout hospitalization in patients admitted with traumatic brain injury. *Clin Nutr*. 2016;35:1315–1322.

Chourdakis M, Kraus MM, Tzellos T, et al. Effect of early compared with delayed enteral nutrition on endocrine function in patients with traumatic brain injury: An open-labeled randomized trial. *J Parenter Enteral Nutr*. 2011;36:108–116.

Collier BR, Cherry-Nukowiec JR, Mills MB. Trauma Surgery and Burns. In *ASPEN Nutrition Support Curriculum*. 2nd ed. 2012. Silver Springs, MD: ASPEN; 2012:392–411.

Costello LS, Lithander FE, Gruen RL, Williams LT. Nutrition therapy in the optimization of health outcomes in adult patients with moderate to severe traumatic brain injury: Findings from a scoping review. *Injury, Int'l J Care Injured*. 2014;45:1834–1841.

Ghajar J. Traumatic brain injury. *Lancet*. 2000;356:923–929.

Hasadsri L, Wang BH, Lee JV, et al. Omega-3 fatty acids as a putative treatment for traumatic brain injury. *J Neurotrauma.* 2013;30:897–906.

Lucke-Wold B, Logsdon AF, Nguyen L, et al. Supplements, nutrition, and alternative therapies for the treatment of traumatic brain injury. *Nutr Neurosci.* 2018;21:79–91.

Koskinen LOD, Olivecrona M, Grande PO. Severe traumatic brain injury management and clinical outcome using the LUND concept. *Neuroscience*. 2014;283:245–255.

Kurtz P, Rocha EEM. Nutrition therapy, glucose control and brain metabolism in traumatic brain injury: A multimodal monitoring approach. *Front Neurosci*. 2020;14:190.

Lichtenberg K, Guay-Berry P, Pipitone A, Bondy A, Rotello L. Compensatory increased enteral feeding goal rates: A way to achieve optimal nutrition. *Nutr Clin Pract*. 2010;25(6):653–657.

Lucke-Wolde BP, Logsdon AF, Nguyen L, et al. Supplements, nutrition and alternative therapies for the treatment of traumatic brain injury. *Nutr Neurosci*. 2018;21:79–91.

Mandaville A, Ray A, Robertson H, Foster C, Jesser C. A retrospective review of swallow dysfunction in patients with severe traumatic brain injury. *Dysphagia*. 2014;29:310–318.

McClave SA, Taylor BE, Martindale RG, et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). *J Parenter Enteral Nutr.* 2016;40:159–211.

Nahikian-Nelms MN. Diseases and disorders of the neurological system. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology.* 4th ed. Belmont, CA: Cengage Learning; 2019:603–640.

Nahikian-Nelms M. Metabolic stress and the critically ill. In Nelms MN, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:674–700.

National Institute for Health and Care Excellence. Head injury. NICE clinical guideline 176. https://www.nice.org.uk/guidance/cg176. Updated September 13, 2019. Accessed March 5, 2020.

Osuka A, Uno T, Nakanishi J, et al. Energy expenditure in patients with severe head injury: Controlled normothermia with sedation and neuromuscular blockade. *J Crit Care*. 2013;28:218.e9–e13.

Taylor B, Brody R, Denmark R, Southard R, Byham-Gray L. Improving enteral delivery through the adoption of the "Feed Early Enteral Diet Adequately for Maximum Effect (FEED ME)" protocol in a surgical trauma ICU. *Nutr Clin Pract.* 2014;29:639–648.

Wang X, Dong Y, Han Xi, et al. Nutritional support for patients sustaining traumatic brain injury: A systematic review and meta-analysis of prospective studies. *PLOS One*. 2013;8:114.

Woodcock T, Morganti-Kossmann M. The role of markers of inflammation in traumatic brain injury. *Front. Neurol*. 2013;4:18. doi: 10.3389/fneur.2013.00018.

Yeh DD, Heyland DK. Enteral nutrition in traumatic brain injury. *J Trauma Acute Care Surg*. 2017;82:649–650.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Internet Resources

American Occupational Therapy Association: http://www.aota.org/About-Occupational-Therapy.aspx
American Physical Therapy Association: http://www.apta.org/AboutPTs/
American Speech Language Hearing Association: http://www.asha.org/.
AND Evidence Analysis Library: http://www.andeal.org
Centers for Disease Control and Prevention: http://www.cdc.gov/TraumaticBrainInjury/
Centers for Disease Control and Prevention. TBI: Get the facts: https://www.cdc.gov/traumaticbraininjury/get_the_facts.html. Updated March 11, 2019. Accessed March 5, 2020.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 23

Pediatric Cerebral Palsy

Holly Estes Doetsch, MS, RDN, LD
The Ohio State University

Olivia Foster presents to the neuromuscular disorders clinic at the local pediatric hospital for a routine assessment and baclofen pump refill. She was born prematurely and diagnosed with spastic quadriplegic cerebral palsy at 10 months of age when parents and pediatrician noticed Olivia was having difficulty achieving normal developmental milestones, particularly functional motor skills. During infancy she also experienced several seizures, which are now well controlled with anti-epileptic therapy. In early childhood, Olivia failed to respond sufficiently to many common therapies for spasticity, including oral baclofen, botulinum toxin, and surgeries. She has responded positively to intrathecal baclofen, increasing her mobility and spending less time in her wheelchair over the past year. Olivia struggles with some oral-motor dysfunction, but has few cognitive limitations. At the current clinic visit, her mom expresses concerns regarding Olivia's weight as well as a recent fall that Olivia experienced a couple days earlier.

Objectives

After completing this case, the student will be able to:

1. Define cerebral palsy (CP) and describe its impact on functional capacity.
2. Identify common nutritional problems associated with CP.
3. Assess and interpret anthropometric measures in conjunction with overall growth patterns.
4. Estimate the nutritional needs for a pediatric patient with CP.
5. Determine nutrition diagnoses, measurable goals, relevant interventions, and appropriate plans for monitoring and evaluating the patient's progress.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Foster, Olivia, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM* **Physician:** *K. Garrison* **Admit Date:** *4/13*

Vaclav Hroch/Shutterstock.com

Patient Summary: Olivia Foster is a 10-year-old female with cerebral palsy, GMFCS level 3. Here for a baclofen pump refill and biannual assessment.

History:

Onset of disease: Patient was born premature at 32 weeks GA, birth weight of 1200 g. Diagnosed with cerebral palsy at 10 months.
Medical history: Spastic quadriplegic cerebral palsy, prematurity, developmental delay, seizure d/o, speech difficulties, GERD, constipation
Surgical history: ITB pump insertion (August 2013), multiple lower limb surgeries (2009–2012)
Medications: Polyethylene glycol 3350 8 g PO BID, lansoprazole 20 mg PO daily, baclofen (2000 mcg/mL) 274 mcg ITB infusion daily, phenytoin 50 mg PO BID, pediatric gummy complete multivitamin 1 PO BID
Social history: Lives at home with her parents and younger brother. Attends school regularly and has several friends. Struggles with math (attends resource room for help), otherwise performing well in school. Communication frustrating for patient secondary to dysarthria. School provides SLP, OT, and PT services.
Family history: Mother—hypertension, irritable bowel syndrome, Father—kidney stones

Demographics:

Years education: Fifth grade
Language: English
Occupation: Student
Household members: Father age 42, mother age 39, brother age 4
Ethnicity: Caucasian
Religious affiliation: Seventh Day Adventist

Admitting History/Physical:

Chief complaint (per mom): "We're here for Olivia's baclofen refill. I think overall she's doing quite well and using her crutches often. She did fall on her hip the other day while playing with the dog, but she keeps telling me she's fine. I'm also a little concerned about her weight. I've noticed she looks a little thinner than usual. Maybe she's having a growth spurt? She still takes her multivitamin twice a day and her meals are pretty balanced."

Vital Signs:

Temp: 98.6°F	Pulse: 72	Respiratory rate: 15	BP: 110/76
Ht: 130.5 cm	Wt: 23.1 kg	BMI: 13.6	

Physical Exam:

General/Constitutional: Thin, 10 y.o. female in no acute distress, smiles easily. Sitting in her wheelchair today.
HEENT: Head: normocephalic and atraumatic
Eyes: anicteric sclera, noninjected conjunctiva
Mouth: oral mucosa pale, dry mucous membranes, dentition in good repair
Throat: pharynx pink without exudates
Neck: soft, supple, no palpable masses. No lymphadenopathy.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Foster, Olivia, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM* **Physician:** *K. Garrison* **Admit Date:** *4/13*

Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants. No masses, no organomegaly. No guarding, rebound, or CVA tenderness. ITB pump lower L abdomen. Rib cage mildly visible.
Extremities: Bruising at L hip, no swelling. Pt rates pain at a 4–5 with palpation. No cyanosis or clubbing or peripheral edema.
Neuromuscular: Conscious, alert, and oriented. Hypertonia, mild to moderate contractures in upper and lower limbs. Altered gait (most recent PT assessment in clinic last fall).
Skin: Pale, dry, normal turgor. No rashes or ulcerations noted.
Psychiatric: Appropriate mood and affect for clinical situation.

Nutrition:

(See Appendix D for Olivia's growth charts.)
General: Olivia sits for most of the day in her classes, but walks the short distances between classes using crutches. She meets with the school physical therapist twice a week. She uses a wheelchair for longer distances, such as during school field trips and outings to the mall. Olivia self-feeds and declines assistance from others when eating, but her aide helps her carry school supplies and take notes during class. She has been following a soft and bite-sized (IDDSI Level 6) diet for most of her life due to some chewing difficulties. The entire family refrains from consuming meat, poultry, and fish. During the school day, Olivia consumes "whatever is being served at the cafeteria" that fits within the realm of a vegetarian and soft and bite-sized diet. She dislikes most sweets. Her mom reports that although her daughter can be a picky eater, she eats fairly consistent portion sizes and at regular times from day to day. On average, Olivia takes around an hour to consume each meal and 20–30 minutes to eat snacks. When asked whether she could eat more if she had more time to do so, Olivia replies, "Probably, but I already feel like I'm eating all the time." GERD is controlled with medication. No coughing or choking with eating and drinking. Bowel movements are fairly consistent; 1–2 soft stools every other day.

24-hour recall:
AM: 2 scrambled eggs (w/ a couple tbsp 1% milk added), 6–8 oz water, 1/2 banana
Lunch: 1/2 c cooked carrots, 4–6 oz chocolate milk, 1/2 c macaroni and cheese (from school cafeteria)
After school snack: 6 oz yogurt with diced strawberries, 6–8 oz water
Dinner: 1/2 c rice and black bean casserole, 1/2 c diced peaches, 4–6 oz 1% milk
Bedtime snack: 6–8 oz water, 1/2 c apple sauce + 1 tsp cinnamon sugar
Sips water periodically throughout the day

Food allergies/intolerances/aversions: NKFA
Previous nutrition therapy? Has seen RD in outpatient clinic and when hospitalized
Food purchase/preparation: Parents
Vit/min intake: Pediatric gummy complete multivitamin 1 PO twice daily

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Foster, Olivia, *Female, 10 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM* **Physician:** *K. Garrison* **Admit Date:** *4/13*

Laboratory Results

	Ref. Range	4/13 1634
Chemistry		
Sodium (mEq/L)	136–145	143
Potassium (mEq/L)	3.5–5.0	4.7
Chloride (mEq/L)	98–108	101
Carbon dioxide (mEq/L)	22–30	25
BUN (mg/dL)	5–18	19 !↑
Creatinine serum (mg/dL)	≤1.2	0.9
Glucose (mg/dL)	70–99	87
Phosphate, inorganic (mg/dL)	2.2–4.6	4
Magnesium (mg/dL)	1.6–2.6	2.4
Calcium (mg/dL)	8.6–10.5	9.6
Bilirubin, total (mg/dL)	≤1.2	1.1
Protein, total (g/dL)	6–7.8	7.8
Albumin (g/dL)	3.5–5	4.9
Prealbumin (mg/dL)	17–39	21
Alkaline phosphatase (U/L)	<500	625 !↑
ALT (U/L)	3–28	18
AST (U/L)	19–28	25
Hematology		
Hemoglobin (g/dL)	11–16	11.5
Hematocrit (%)	31–43	32
Vitamin D 25 hydroxy (ng/mL)	30–100	16 !↓

Assessment and Plan: 10 y.o. female with spastic quadriplegic CP here for ITB pump refill and 6-month visit. Continuing to respond well to baclofen, spending less time in her wheelchair, though had a recent fall. Labs notable for low 25-OH vit D. Evaluate BMD (most recent DEXA 3 years ago). Pt's weight has deviated from curve over the past year, will discuss with Nutrition.

Medical Tx Plan: Refill ITB pump, 20 mL. Continue current dosing regimen.
Obtain GGT; B-ALP; PTH, intact
L hip XR
DEXA scan
PT consult re: repeat gait analysis and fall prevention.
Nutrition consult re: optimizing growth, vit D status.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. What is cerebral palsy (CP)? Identify several risk factors for CP.

2. What functional abilities can be impacted by CP? What is the Gross Motor Function Classification System (GMFCS)? What does a GMFCS score of 3 indicate?

3. What is a baclofen pump and how is it used to manage CP?

4. Poor growth secondary to poor nutrition status is a common problem in pediatric patients with CP. Summarize at least three factors that may contribute to malnutrition and subsequent poor growth in CP.

5. In what ways does nutritional status influence health outcomes in children with CP?

II. Understanding the Nutrition Therapy

6. What are limitations to using standard height and weight measurement tools in CP patients? What are commonly used methods for assessing height and weight in children with CP? Are there other anthropometric measures that may be useful?

7. What are the limitations to using reference standards of growth in children with CP? What are factors to consider when interpreting growth data in this patient population?

8. What are factors that impact the caloric needs of CP patients? Which ones are relevant to the current patient?

9. Define "metabolic bone disease." What are factors that may increase the risk for metabolic bone disease in CP, and which factors apply to the current patient?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

10. Briefly describe the process through which vitamin D deficiency impacts bone remodeling. Why is the serum calcium level often normal in patients with vitamin D deficiency?

III. Nutrition Assessment

11. Review Olivia's growth chart and identify the percentiles and z-scores that correspond with her current measurements (see Appendix D for Olivia's growth chart). Describe the patient's growth velocity over the past year. How would you interpret this information, while considering the indicators recommended by AND/ASPEN for the diagnosis of pediatric malnutrition?

12. Determine Olivia's daily caloric, protein, and fluid intake based on her 24-hour recall. Calculate Olivia's caloric, protein, and fluid requirements. Support the methods you used to calculate these values.

13. Compare Olivia's reported intake with her estimated needs. Identify at least three key nutrients inadequate in her diet.

14. Identify the abnormal laboratory values, and for each one, describe potential causes for these abnormalities.

IV. Nutrition Diagnosis

15. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

16. For each PES statement, establish an appropriate goal (based on the signs and symptoms) and intervention (based on the etiology).

17. Integrating strategies to increase caloric density of foods and beverages consumed is a common nutrition intervention used for pediatric patients with poor growth. Based on Olivia's 24-hour recall, what are specific suggestions you could offer the patient?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

18. Olivia takes a daily multivitamin supplement that includes 600 IUs of vitamin D. Would you recommend additional vitamin D supplementation? If so, outline your recommendation. Would you recommend that any additional micronutrient labs be obtained?

VI. Nutrition Monitoring and Evaluation

19. Write an ADIME note for your initial nutrition assessment. When would be an appropriate time to follow up with Olivia and reassess her nutrition status?

20. Multidisciplinary treatment is essential to address the multiple co-morbidities associated with CP. List three other health professionals who commonly play a role in the care of CP patients. Describe the role of each one.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Andrew MJ, Sullivan PB. Growth in cerebral palsy. *Nutr Clin Pract*. 2010;25(4):357–361.

Arvedson JC. Feeding children with cerebral palsy and swallowing difficulties. *European J Clin Nutr.* 2013;67:S9–S12.

Becker P, Carney LN, Corkins MR, et al. Consensus statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Indicators recommended for the identification and documentation of pediatric malnutrition (undernutrition). *Nutr Clin Pract.* 2015;30(1):147–161.

Behavioral Health Nutrition Dietetics Practice Group and Pediatric Nutrition Practice Group. *Academy of Nutrition and Dietetics pocket guide to children with special health care and nutritional needs.* Chicago, IL: Academy of Nutrition and Dietetics; 2012. https://publications.webauthor.com/pub/HCNPG/ [login credentials required]. Accessed April 1, 2020.

Houlihan CM, Stevenson RD. Bone density in cerebral palsy. *Phys Med Rehabil Clin N Am.* 2009;20(3):493–508.

Jesus AO, Stevenson RD. Optimizing nutrition and bone health in children with cerebral palsy. *Phys Med Rehabil Clin N Am.* 2020;31(1):25–37.

Kuperminc MN, Gottrand F, Samson-Fang L, et al. Nutritional management of children with cerebral palsy: A practical guide. *Eur J Clin Nutr.* 2013;67:S21–S23.

Kuperminc MN, Stevenson RD. Growth and nutrition disorders in children with cerebral palsy. *Dev Disabil Res Rev.* 2008;14(2):137–146.

Lark RK, Williams CL, Stadler D, et al. Serum prealbumin and albumin concentrations do not reflect nutritional state in children with cerebral palsy. *J Pediatr.* 2005;147:695–697.

Mughal MZ. Fractures in children with cerebral palsy. *Curr Osteoporos Rep.* 2014;12(3):313–318.

Rempel G. The importance of good nutrition in children with cerebral palsy. *Phys Med Rehabil Clin N Am.* 2015;26(1):39–56.

Samson-Fang L, Bell KL. Assessment of growth and nutrition in children with cerebral palsy. *Eur J Clin Nutr.* 2013;67:S5–S8.

Wittenbrook W. Nutritional assessment and intervention in cerebral palsy. *Pract Gastroenterol.* 2011;32(2):16, 21–32. http://www.medicine.virginia.edu/clinical/departments/medicine/divisions/digestive-health/clinical-care/nutrition-support-team/nutrition-articles/WittenbrookArticle.pdf. Accessed April 1, 2020.

Internet Resources

Centers for Disease Control and Prevention. Cerebral Palsy: http://www.cdc.gov/ncbddd/cp/

Centers for Disease Control and Prevention. Growth Charts: http://www.cdc.gov/growthcharts/

National Institute of Neurological Disorders and Stroke: http://www.ninds.nih.gov/disorders/cerebral_palsy/cerebral_palsy.htm

Nutrition Care Manual: https://www.nutritioncaremanual.org/

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Nine

NUTRITION THERAPY FOR PULMONARY DISORDERS

The case in this section portrays the interrelationship between nutrition and the respiratory system. In a healthy individual, the respiratory system receives oxygen for cellular metabolism and expires waste products—primarily carbon dioxide. Fuels—carbohydrate, protein, and lipid—are metabolized, using oxygen and producing carbon dioxide. The type of fuel an individual receives can affect physiological conditions and interfere with normal respiratory function. Malnutrition can impair the function of the respiratory system as well.

Nutritional status and pulmonary function are interdependent. Malnutrition can evolve from pulmonary disorders and can contribute to declining pulmonary status. The incidence of malnutrition is common for people with chronic obstructive pulmonary disease (COPD), ranging anywhere from 25% to 50%. In respiratory disease, maintaining nutritional status improves muscle strength needed for breathing, decreases risk of infection, facilitates weaning from mechanical ventilation, and improves ability for physical activity.

The American Thoracic Society defines COPD as a disease process of chronic airway obstruction caused by chronic bronchitis, emphysema, or a combination of both. These conditions place a significant burden on the health-care systems in the United States.

In Case 24, underlying COPD is complicated by COVID-19 infection resulting in respiratory failure. The complexity of this infection and the subsequent systemic inflammatory response is challenging for the entire medical team, including the registered dietitian, who will be responsible for planning nutrition support for this individual.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 24

Chronic Obstructive Pulmonary Disease

Emelia Stamm was initially diagnosed with mild COPD (GOLD 1 criteria) 14 years ago. She is now admitted with increasing shortness of breath requiring mechanical ventilation after exposure to a neighbor diagnosed with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Objectives

After completing this case, the student will be able to:

1. Identify and explain common nutritional problems associated with this disease.
2. Assess the impact of the coronavirus (COVID-19) on pulmonary status.
3. Determine appropriate feeding plans in acute and chronic obstructive pulmonary disease (COPD).
4. Identify effects of nutrient metabolism on pulmonary function.
5. Determine nutrition diagnoses and write appropriate PES statements.
6. Develop interventions for both acute and chronic respiratory diseases.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Stamm, Emelia, *Female, 74 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Airborne infection isolation room*
Pt. Location: *MICU RM 614* **Physician:** *P. Haus* **Admit Date:** *4/25*

Flashon Studio/Shutterstock.com

Patient Summary: Acute exacerbation of COPD, increasing dyspnea, hypercapnia, agnosia—r/o SARS-CoV-2.

History:

Onset of disease: Initially diagnosed with mild COPD (GOLD 1 criteria) 14 years ago.
Medical history: Recurrent upper respiratory infections since diagnosis after caring for her grandchildren. Also with T2DM for the last 25 years that is well managed with diet and metformin.
Surgical history: No surgeries
Medications at home: Ipratropium and albuterol inhaler—1 inhalation 4 times daily (each inhalation delivers 20 mcg ipratropium bromide; 100 mcg albuterol sulfate)
Tobacco use: Yes. 46 years, 1 PPD history—has not smoked for past year.
Alcohol use: No
Family history: What? Cancer. Who? Father—lung cancer

Demographics:

Marital status: Married, lives with husband (aged 76) who also has T2DM
Years education: Some high school
Language: English only
Occupation: Assists with care of her grandchildren
Hours of work: M–F, 8 a.m.–1 p.m.
Ethnicity: Caucasian
Religious affiliation: Christian, nondenominational

Admitting History/Physical:

Chief complaint: Taken by spouse as patient is intubated. "About one week ago, she started complaining of a loss of appetite because food tasted bland. Since then she has been increasingly tired and this morning she spiked a fever of 101.4°F. She seemed confused all morning so I called an ambulance. We haven't really been around anyone over the last two weeks other than my neighbor, but one of them just told me they tested positive for the coronavirus. Do you think she has the virus? Will she be OK?"

Vital Signs:

Temp: 101.4°F	Pulse: 91	Resp rate: 24
BP: 90/76	Height: 5'4"	Weight: 156 lbs

HEENT: Eyes: PERRLA, no hemorrhages
Ears: slight redness
Nose: nasal congestion
Throat: sore throat
Cardiac: Regular rate and rhythm; mild jugular distension noted.
Pulmonary/Chest: Decreased breath sounds, cough, orthopnea, prolonged expiration with wheezing; using accessory muscles at rest; pulse oximeter at 87%.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Stamm, Emelia, *Female, 74 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Airborne infection isolation room*
Pt. Location: *MICU RM 614* **Physician:** *P. Haus* **Admit Date:** *4/25*

Abdominal: Liver, spleen palpable; nondistended, nontender, normal bowel sounds.
Extremities: 1+ bilateral pitting edema. No cyanosis or clubbing.
Neurological: Disoriented to time and place; cranial nerves intact.
Skin: Warm, dry
Psychiatric: Negative

Nursing Assessment	**4/25**
Abdominal appearance (concave, flat, rounded, obese, distended)	rounded
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	brown
Stool consistency	soft
Tubes/ostomies	NA
Genitourinary	
Urinary continence	yes
Urine source	clean catch
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	clear, yellow
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	W, dry
Skin turgor (good, fair, poor, TENT=tenting)	good
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	activity, 18

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Stamm, Emelia, *Female, 74 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Airborne infection isolation room*
Pt. Location: *MICU RM 614* **Physician:** *P. Haus* **Admit Date:** *4/25*

Orders:

Admission to MICU.
RT to manage ventilator settings—keep O_2 saturation 91–93%.
IVF D_5 / NS with 20 mEq KCl @ 75 cc/hr.
Midazolam (100 mg/100 mL) in 0.9% NaCl, start with 0.5 mg and titrate as needed.
Start insulin drip (1 unit regular insulin in 0.9% NaCl) with target BGL of 180 mg/dL.
Accuchecks q 6 hrs. Notify MD if >400 mg/dL.
R/o SARS-CoV-2; sputum cultures and Gram stain, nasal specimen.
ABGs q 6 hours; CXR—PA/LAT.

Nutrition:

General: Spouse states recent lack of appetite and poor sense of taste. She does most of the cooking, but they do order takeout a few times per week because she gets tired easily. Highest adult weight was 162 lbs (2 years ago), but she has been trying to eat well this last year and lost a few pounds. She is really good about watching what they eat because they both have T2DM.

Usual dietary intake:

AM:	Tea—black, dry cereal, nondairy yogurt
Lunch:	Usually soup, sandwich, or salad. Lately, she has been skipping this because nothing tastes good.
Snack:	Chips, pretzels, or crackers. Sometimes fruit.
Dinner/evening meal:	Meat, potato, and vegetable. Drinks Diet Pepsi® throughout the day (usually 3 12-oz cans).
Anthropometric data:	Ht. 5'4", Wt. 156 lbs, UBW 153–158 lbs.

Food allergies/intolerances/aversions: Avoids milk: "People say it will increase mucus production."
Previous nutrition therapy? Yes, diabetes education over 10 years ago
Food purchase/preparation: Self; Takeout 3–4 times per week
Vit/min intake: Multivitamin most days

Laboratory Results

	Ref. Range	4/25 0600	4/27 0600
Chemistry			
Sodium (mEq/L)	136–145	137	
Potassium (mEq/L)	3.5–5.1	4.3	
Chloride (mEq/L)	98–107	105	
Carbon dioxide (mEq/L)	23–29	33 !↑	
BUN (mg/dL)	6–20	21 !↑	
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.2 !↑	

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Stamm, Emelia, *Female, 74 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Airborne infection isolation room*
Pt. Location: *MICU RM 614* **Physician:** *P. Haus* **Admit Date:** *4/25*

Laboratory Results *(Continued)*

	Ref. Range	4/25 0600	4/27 0600
BUN/Crea ratio	10.0–20.0	17	
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	4.2	
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	53 !↓	
Glucose (mg/dL)	70–99	164 !↑	
Phosphate, inorganic (mg/dL)	2.2–4.6	3.4	
Magnesium (mg/dL)	1.5–2.4	1.9	
Calcium (mg/dL)	8.6–10.2	8.4 !↓	
Anion gap (mmol/L)	10–20	7.0 !↓	
Osmolality (mmol/kg/H_2O)	275–295	297 !↑	
Bilirubin, total (mg/dL)	≤1.2	0.9	
Bilirubin, direct (mg/dL)	<0.3	0.1	
Protein, total (g/dL)	6–7.8	5.7 !↓	
Albumin (g/dL)	3.5–5.5	3.2 !↓	
Prealbumin (mg/dL)	18–35	13 !↓	
Ammonia (µg/L)	6–47	15	
Alkaline phosphatase (U/L)	30–120	111	
ALT (U/L)	4–36	33	
AST (U/L)	0–35	35	
CPK (U/L)	30–135 F 55–170 M	46	
Lactate dehydrogenase (U/L)	208–378	295	
Cholesterol (mg/dL)	<200	210 !↑	
HDL-C (mg/dL)	>50 F, >40 M	55	
VLDL (mg/dL)	7–32	30	
LDL (mg/dL)	0–99	100	
LDL/HDL ratio	<4.5	1.8	
Triglycerides (mg/dL)	<150	140	
HbA_{1C} (%)	<5.7	5.5	

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Stamm, Emelia, *Female, 74 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Airborne infection isolation room*
Pt. Location: *MICU RM 614* **Physician:** *P. Haus* **Admit Date:** *4/25*

Laboratory Results *(Continued)*

	Ref. Range	4/25 0600	4/27 0600
Coagulation (Coag)			
PT (sec)	11–13	12.1	
INR	0.9–1.1	0.9	
Hematology			
WBC ($\times 10^3/mm^3$)	3.9–10.7	18.3 !↑	
BC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	4.0 !↓	
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	11.8 !↓	
Hematocrit (Hct, %)	37–47 F 41–51 M	34 !↓	
Hematology, Manual Diff			
Neutrophil (%)	40–70	61	
Lymphocyte (%)	22–44	52 !↑	
Monocyte (%)	0–7	6	
Eosinophil (%)	0–5	6 !↑	
Basophil (%)	0–2	0	
Blasts (%)	3–10	5	
Segs (%)	0–60	85 !↑	
Bands (%)	0–10	3	
Arterial Blood Gases (ABGs)			
pH	7.35–7.45	7.35	7.37
pCO_2 (mm Hg)	35–45	51 !↑	45
SO_2 (%)	≥95	88 !↓	91 !↓
CO_2 content (mmol/L)	25–30	27	32 !↑
O_2 content (%)	15–22	12 !↓	18
pO_2 (mm Hg)	≥80	80	87
HCO_3^2 (mEq/L)	21–28	27	30 !↑

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Diagnosis and Pathophysiology

1. Describe the Global Initiative for Chronic Obstructive Lung Disease (GOLD). What is FEV1 and how is it used in the diagnosis of COPD? What is the role that cigarette smoking plays in the etiology of COPD?

2. What is SARS-CoV-2? What signs/symptoms is Mrs. Stamm experiencing that are consistent with a diagnosis of SARS-CoV-2?

3. Describe the critical role of the respiratory therapist in the respiratory management of COPD and SARS-CoV-2. How does their role differ in acute verses chronic respiratory diseases?

4. Review Mrs. Stamm's arterial blood gas (ABG) values from the day she was admitted.

a. Why would ABGs be drawn for this patient?

b. Define each of the following and interpret Mrs. Stamm's values:

pH:

pCO_2:

SO_2:

HCO_3^2:

II. Understanding Nutrition Therapy

5. What are the most common nutritional concerns for someone with COPD? Why is the patient diagnosed with COPD at higher risk for malnutrition?

6. Mrs. Stamm has tested positive for SARS-CoV-2. She is expected to have a prolonged ICU course requiring mechanical ventilation. Review the recommendations for ASPEN and

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

ESPEN for nutrition therapy in SARS-CoV-2. What is the role of enteral and parenteral nutrition support? Should Mrs. Stamm be started on nutrition support? Why or why not?

7. Mrs. Stamm's pulmonary status is deteriorating and the RT recommends adopting prone positioning for mechanical ventilation. What is the evidence for use of EN when the patient is in a prone position?

8. Placement of an enteral access device is considered an aerosol-generating procedure. Describe the concerns the medical team has with placement of an enteral access device. What steps can be taken to minimize exposure to the team during placement of the device?

III. Nutrition Assessment

9. Prior to the RDN consultation, Mrs. Stamm was started on Glucerna® 1.5 at 70 cc/hr via NGT. The RDN is concerned that this prescription is inappropriately dosed, but there is no access to indirect calorimetry (IC) since ASPEN recommends avoiding IC in SARS-CoV-2 confirmed cases. What is IC and why should it be avoided in Mrs. Stamm's case?

10. Calculate Mrs. Stamm's BMI and estimate her energy and protein requirements. How do these estimations compare to her current EN prescription?

11. What is the role of hypocaloric or trophic feeding in the early acute phase of the stress response? Should hypocaloric or trophic feeding be considered for Mrs. Stamm during the first week of ICU admission?

12. Evaluate Mrs. Stamm's laboratory values. Identify those that are abnormal and provide an explanation for these abnormalities.

IV. Nutrition Diagnosis

13. Select two nutrition problems and complete the PES statement for each.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

V. Nutrition Intervention

14. For each of the PES statements you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).

15. As Mrs. Stamm stabilizes and is removed from mechanical ventilation, she will be discharged to a regular nursing floor and ultimately to pulmonary rehabilitation for management of her worsening COPD. At pulmonary rehabilitation, Mrs. Stamm is concerned that her BGL have been elevated since leaving the ICU. What recommendations should the RDN provide to address both her COPD and T2DM?

VI. Nutrition Monitoring and Evaluation

16. You are now seeing Mrs. Stamm at her second visit to pulmonary rehabilitation. She is using home oxygen now and her weight is 141 lbs. The nutrition-focused physical exam reveals mild muscle and fat wasting, 1+ lower extremity edema, and continued fatigue. She explains that her blood sugars have improved, but she hasn't felt like eating very much. She is concerned about her worsening COPD. When you talk with her, you find she struggles to get out of bed in the morning and is skipping breakfast most days. She is having no specific intolerances, but she does tell you she hasn't consumed any milk products because she thought they would cause more sputum to be produced.

Monday

Breakfast: Tea—black; 1 c orange juice; 1 hardboiled egg; 1 slice whole wheat toast with 2 tsp butter

Lunch: 1 c chicken salad (made with 3 ounces chicken breast, 2 tbsp mayo, ¼ stalk of celery on 2 slices wheat bread); 1 c grapes; Diet Pepsi®

Supper: 1 McDonald's® hamburger; Diet Pepsi—approx. 36 oz

Tuesday

Breakfast: Skipped. Tea—peppermint

Lunch: Popcorn nuggets (from kids' menu) from Kentucky Fried Chicken®; ½ c mashed potatoes; 2 tbsp gravy; 1 c coffee with 2 tbsp nondairy creamer

Supper: Apple—medium; 1 tbsp peanut butter; 1 can V8® juice (6 oz); Diet Pepsi, approx. 24 oz

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

a. Is Mrs. Stamm meeting her calorie and protein goals?

b. What would you tell her regarding the use of supplements and/or milk and sputum production?

c. Using information from her food diary as a teaching tool, identify three interventions you would propose for Mrs. Stamm to increase her calorie and protein intake.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Evidence Analysis Library. Chronic obstructive pulmonary disease guideline. http://www.andeal.org/topic.cfm?menu=5301. Accessed March 2, 2020.

Academy of Nutrition and Dietetics Nutrition Care Manual. Chronic obstructive pulmonary disease (COPD). https://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=1&lv1=5538&lv2=22249&ncm_toc_id=22249&ncm_heading=Nutrition%20Care. Accessed on March 2, 2020.

Amalakuhan B, Adams SG. Improving outcomes in chronic obstructive pulmonary disease: The role of the interprofessional approach. *Int J Chron Obstruct Pulmon Dis*. 2015;10:1225–1232.

Calder PC, Laviano A, Lonngvist F, et al. Targeted medical nutrition therapy for cachexia in chronic obstructive pulmonary disease: A randomized, controlled trial. *J Cachexia Sarcopeni*. 2018;9(1):28–40.

Chapman S. Pulmonary rehabilitation for people with chronic obstructive pulmonary disease: An evidence review. *Br J Community Nurs*. 2017;22:608–610.

Collins P, Elia M, Stratton R. Nutritional support and functional capacity in chronic obstructive pulmonary disease: A systematic review and meta-analysis. *Respirology*. 2013;18:1217–1222.

Global Initiative for Chronic Obstructive Lung Disease (GOLD). 2020 Global strategy for prevention, diagnosis and management of COPD. https://goldcopd.org/gold-reports/. Accessed June 6, 2020.

Ingadottir AR, Beck AM, Baldwin C, et al. Two components of the new ESPEN diagnostic criteria for malnutrition are independent predictors of lung function in hospitalized patients with chronic obstructive pulmonary disease. *Clin Nutr*. Epub 2017;37(4):1323–1331. http://dx.doi.org/10.1016/j.clnu.2017.05.031. Accessed June 6, 2020.

Laviano A, Koverech A, Zanetti M. Nutrition support in the time of SARS-CoV-2 (COVID-19). *Nutrition*. 2020;74:110834.

Martindale R, Patel J, Taylor B, et al. Nutrition therapy in the patient with COVID-19 disease requiring ICU care. American Society for Parenteral and Enteral Nutrition. https://www.nutritioncare.org/COVID19/. Accessed June 6, 2020.

National Guideline Clearinghouse (NGC). Guideline summary NGC-7966: Chronic obstructive pulmonary disease. In National Guideline Clearinghouse (NGC). Rockville, MD: Agency for Healthcare Research and Quality (AHRQ); 2010 Oct. http://www.guideline.gov. Accessed June 6, 2020.

National Guideline Clearinghouse (NGC). Guideline synthesis: Chronic obstructive pulmonary disease (COPD): Diagnosis and management of acute exacerbations. In National Guideline Clearinghouse (NGC). Rockville, MD: Agency for Healthcare Research and Quality (AHRQ); 2001 Dec (revised 2011 Oct). http://www.guideline.gov. Accessed June 6, 2020.

Raad S, Smith C, Allen K. Nutrition status and chronic obstructive pulmonary disease: Can we move beyond the body mass index? *Nutr Clin Pract*. 2019;34(3):330–339.

Ryrso CK, Godtfredsen NS, Koford LM, et al. Lower mortality after early supervised pulmonary rehabilitation following COPD-exacerbations: A systematic review and meta-analysis. *BMC Pulm Med*. 2018;18:154.

Sergakis G, Nahikian-Nelms MN. Diseases of the respiratory system. In Nelms MN, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:641–673.

Zabetakis I, Lordan R, Norton C, et al. COVID-19: The inflammation link and the role of nutrition in potential mitigation. *Nutrients*. 2020;12:1466.

Zheng PF, Shu L, Si CJ, et al. Dietary patterns and chronic obstructive pulmonary disease: A meta-analysis. *COPD*. 2016;13(4):515–522.

Internet Resources

American Lung Association: http://www.lung.org/lung-disease/copd/

Centers for Disease Control and Prevention. Chronic obstructive pulmonary disease (COPD): http://www.cdc.gov/copd/

Centers for Disease Control and Prevention. Get the facts about coronavirus: https://www.cdc.gov/coronavirus/2019-ncov/index.html

Centers for Disease Control. Health, United States, 2016. Table 17: http://www.cdc.gov/nchs/data/hus/hus16.pdf#017.

COPD International: http://www.copd-international.com/

National Heart Lung and Blood Institute/Learn More Breathe Better: http://www.nhlbi.nih.gov/health/educational/copd/

USDA Nutrient Data Laboratory: http://ndb.nal.usda.gov/

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Ten

NUTRITION THERAPY FOR METABOLIC STRESS AND CRITICAL ILLNESS

The physiological response to stress, trauma, and infection has been an important area of nutrition research for the past several decades. This metabolic response is characterized by catabolism of stored nutrients to meet the increased energy requirements.

Unlike other situations in which the body faces increased energy requirements, the stress response demands a preferential use of glucose for fuel. Because glycogen stores are quickly depleted, the body turns to lean body mass for glucose produced via gluconeogenesis.

Under the influence of counterregulatory hormones such as glucagon, epinephrine, norepinephrine, and cortisol, as well as cytokines such as interleukin and tumor necrosis factor, the body shifts from its normal balanced state, or anabolism, to catabolism. All sources of fuel metabolism are affected by the stress response and the subsequent control of counterregulatory hormones. Despite increased lipolysis, the efficiency of the use of fatty acids and glycerol as sources of fuel is reduced.

The body's inability to keep up with the rate of protein catabolism results in loss of skeletal muscle and high urinary losses of nitrogen. The liver's rate of gluconeogenesis is increased, and hyperglycemia is common. In addition, many tissues—especially skeletal tissue—develop insulin resistance, which contributes to the hyperglycemic state.

Cases 25 and 26 focus on the application of evidenced-based guidelines to inform the decision making for nutrition support. Nutrition support can serve as an integral component of the medical care and can impact the metabolic response. With increasing rates of obesity in the United States, the necessity of providing nutrition support in the morbidly obese patient (as in Case 26) is an increasingly common challenge for the RDN.

The opioid epidemic has impacted medical care in many ways. Those experiencing a trauma have a higher rate of opioid abuse post-ICU (intensive care unit) discharge; however, medical teams also are faced with those admitted for a trauma that are concurrently abusing opioids. Case 25 presents a male with chronic back pain who has been abusing prescription pain medication. After experiencing a GSW to the abdomen, his post-surgical care is compromised by opioid withdrawal. This case provides an avenue to discuss the impact of drug abuse on EN tolerance and focuses the student on understanding the assessment process for EN.

The true complexity of patients seen in an ICU is demonstrated in Case 26. A patient who received surgical treatment for morbid obesity with multiple comorbidities is requiring nutrition support after admission with sepsis. Students are faced with prioritizing many nutritional concerns to establish an appropriate plan of care. Energy, fluid, and micronutrient assessment are all presented, as are how these assessments impact the nutrition support decision-making process.

Other conditions resulting in metabolic stress include trauma, open wounds, and sepsis. These situations also demand close attention to nutrition support to minimize complications of protein-calorie malnutrition and to optimize recovery assisted by medical nutrition therapy. You can easily transfer the same concepts for nutrition assessment and support to other individual cases you may encounter.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 25

Metabolic Stress and Trauma: Gunshot Wound

Kenneth Smith is a 25-year-old male admitted to the surgical intensive care unit with a gunshot wound to the abdomen requiring an antrectomy and billroth II reconfiguration of his gastrointestinal tract.

Objectives

After completing the case, the student will be able to:

1. Apply the knowledge of the pathophysiology of trauma and metabolic stress in order to provide nutrition support for the critically ill patient.
2. Identify the impact of opioid abuse on the medical care of a trauma patient.
3. Compare different predictive equations that are appropriate for use in the critically ill population.
4. Use current evidence-based guidelines to evaluate, plan, and monitor nutrition support for the critically ill.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Smith, Kenneth, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *Bed #2 SICU* **Physician:** *D. Evans, MD* **Admit Date:** *3/22*

ShotPrime Studio/Shutterstock.com

Patient Summary: The patient was brought into the ED by ambulance after he was shot twice in the abdomen while riding as a passenger in a motor vehicle. Upon arrival to the ED, he was in respiratory distress, hypotensive, and positive for hematemesis. His wife met the ambulance in the ED and was able to report any pertinent past medical history.

History:

Medical history: Chronic back pain
Surgical history: None
Medications at home: Oxycodone prn
Tobacco use: Yes, ½ pack per day
Alcohol use: Social

Demographics:

Marital status: Married; lives with his wife and their two children, ages 2 and 4
Language: English
Occupation: Warehouse supervisor
Ethnicity: Mexican American
Religious affiliation: Catholic

Admitting History/Physical:

General appearance: Overweight 25-year-old male on mechanical ventilation requiring emergent surgery due to hemodynamic instability after GSW × 2 to the abdomen.

Vital Signs:

Temp: 98.9°F	Pulse: 87	Resp rate: 20
BP: 99/49	Height: 72"	Weight: 98 kg

HEENT: Eyes: pupils equal and reactive, extraocular eye movements intact, sclera anicteric, left eye normal, right eye normal
Ears: external ear canals normal, right ear normal, left ear normal
Nose: normal and patent, no erythema
Mouth: mucous membranes moist, pharynx normal without lesions
Neck: supple, no significant adenopathy, trachea midline
Cardiac: RRR, no m/r/g, BP stable
Pulmonary/chest: Spontaneous breathing, bilateral breath sounds, equal chest rise, no pneumothorax
Abdominal: Soft, diffuse tender, significantly distended, wound in right lower flank and left upper flank. Continues to have mild sanguineous oozing from both wounds.
Extremities: Peripheral pulses normal (radial, femoral, dorsalis pedis/posterior tibial), no pedal edema, no clubbing or cyanosis.
Neurological: Sedated GCS 14, alert, oriented, normal speech, no focal findings or movement disorder noted, cranial nerves II through XII intact, motor and sensory grossly normal bilaterally.
Skin: Normal coloration and turgor, no rashes, no suspicious skin lesions noted.
Psychiatric: Deferred

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Smith, Kenneth, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *Bed #2 SICU* **Physician:** *D. Evans, MD* **Admit Date:** *3/22*

Dx: Abdominal GSW × 2

Tx plan: Emergent OR

MD Progress Note:
Hospital Day #5
3/27 0840

Admission History
Kenneth Smith is a 25-y.o. male who suffered a GSW to the abdomen. In the ED a FAST scan was performed and found to be positive and he was transferred emergently to the OR. In the OR, he underwent antrectomy and billroth II reconstruction with ligation of bleeding peripancreatic vessels, coagulation of liver laceration, and placement of perihepatic and peripancreatic drains. Following the OR, he was transferred to the SICU intubated and hemodynamically stable. Negative PMH except for concern for opioid abuse as wife reports "excessive opioid use after work-related back injury 3 years ago."
Hospital Day #2 (3/24): Acute opioid withdrawal—febrile, tachypnea, and hyperactive delirium. Treatment protocol initiated—buprenorphine 2 mg. High output NGT.
Hospital Day #4 (3/26): Return to OR for concern of anastomotic leak. Gastrojenunal leak found and repaired, placement of jejunostomy. Start Pivot® 1.5 via NGT—consult RDN for goal rate.

Subjective: Kenneth Smith previous 24 hours reviewed.
Vitals: Temp: 99.1°F, Pulse: 82, Resp rate: 15, BP: 122/78, Wt: 105 kg, O_2 Sat (%): 93%
I/O last 3 completed shifts:
In: 3030 (IV 1800, Propofol 600, EN 270, IV Piggyback 360)
Out: 4635 (Urine: 2825, JP ×2: 330, NGT 1480)
General/Constitutional: NAD, lying in bed, sedated
HEENT: Normocephalic, PERRLA
Cardiac: RRR
Pulmonary/chest: No wheezes or crackles
Abdominal: Soft, appropriately tender, midline laparotomy with fascia closed and intact, skin open, JP × 2 serosanguinous; +flatus, jejunostomy feeding tube in place
Extremities: Warm, 4+ lower extremity edema noted, peripheral pulses throughout
Neurological: Moves all extremities spontaneously—sedated
Psychiatric: WNL, hx of depression
IV Fluid: D5 0.45 @75 mL/hr
Nutrition: NPO, EN, nutrition consult
Glycemic control: Insulin drip as per institution protocol
Mobility: As tolerates per PT treatment plan

..... F. Mitchell, MD—Surgical Resident
..... D. Evans, MD—Trauma Attending

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Smith, Kenneth, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *Bed #2 SICU* **Physician:** *D. Evans, MD* **Admit Date:** *3/22*

Nutrition Consult—Follow-up: 3/28 Hospital Day #6
A: 25-y.o. male s/p GSW to the abdomen c/b opioid withdrawal. Pt required emergent exploratory laparotomy at admission, now with antrectomy and billroth II anatomy and jejunostomy feeding tube in place with Pivot 1.5 at 15 cc/hr. Unable to advance per nursing report, concern for post-operative ileus versus narcotic bowel secondary opioid abuse.
Ht: 72" Adm Wt: 98 kg Current wt: 105 kg IBW: 80.9 kg
Metabolic cart measurement: REE 3420 kcal RQ 0.78
Current nutrition support: Pivot 1.5 at 15 cc/hr via jejunostomy.
Propofol @ 25 mL/hr providing additional 660 kcal for total of:
1200 kcal (14.8 kcal/kg IBW/day) and 34 g protein (0.4 g/kg IBW/day)
Labs and medications reviewed.
D: Increased energy expenditure related to post-trauma status as evidenced by metabolic cart measurement of 3420 kcal expenditure.
Altered GI function related to postoperative ileus verses narcotic bowel as evidenced by lack of bowel sounds, no stool output, high NGT output, and inability to advance EN past 15 cc/hr.
I: Continue Pivot 1.5 @ 15 cc/hr. Discuss with pharmacy the possible use of metoclopramide via jejunostomy to improve EN tolerance. If no improvements in GI function within 48 hours, consider lipid-free supplemental parenteral nutrition to meet 100% estimated nutritional needs.
M/E: Once metoclopramide is initiated, NFPE to assess for improvements in GI function (abdominal assessment with +BS/less abdominal distention and/or presence of stool). Once improvement noted in GI function, increased Pivot 1.5 by 10 cc q 4 hrs to goal rate of 75 cc/hr. Once EN is at goal, EN + propofol = 3360 kcals/day, 169 g protein. Reassess IC in 72 hours.

G. Moccia, MS, RD, CNSC

Nursing Assessment	3/28
Abdominal appearance (concave, flat, rounded, obese, distended)	distended—wound VAC in place
Palpation of abdomen (soft, rigid, firm, masses, tense)	N/A
Bowel function (continent, incontinent, flatulence, no stool)	no stool
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	AB
LUQ	AB
RLQ	AB
LLQ	Hypo
Stool color	N/A
Stool consistency	N/A
Tubes/ostomies	J-P drains × 2
Genitourinary	
Urinary continence	Catheter
Urine source	Catheter

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Smith, Kenneth, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *Bed #2 SICU* **Physician:** *D. Evans, MD* **Admit Date:** *3/22*

Nursing Assessment *(Continued)*

Nursing Assessment	3/28
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	cloudy, pale yellow
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	DI
Skin turgor (good, fair, poor, TENT=tenting)	fair
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	A, D
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤ 12 = high risk)	11

Intake/Output

Date		**3/26 0701–3/27 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**0**	**0**	**0**	**0**
	I.V.	**600**	**600**	**600**	**1800**
	(mL/kg/hr)	(0.77)	(0.77)	(0.77)	(0.77)
	I.V. piggyback	**120**	**120**	**120**	**360**
	Propofol	**200**	**200**	**200**	**600**
	EN	**60**	**90**	**120**	**270**
	Total intake				**3030**
	(mL/kg)	(10)	(10)	(11)	(30.9)
OUT	Urine	**915**	**680**	**1230**	**2825**
	(mL/kg/hr)	(1.2)	(0.87)	(1.6)	(1.2)
	NG Output	**480**	**600**	**400**	**1480**
	Other (JP drains)	**125**	**95**	**110**	**330**
	Stool				**0**
	Total output				**4635**
	(mL/kg)	(15.5)	(14.0)	(17.8)	(47.3)
Net I/O		**−540**	**−365**	**−700**	**−1605**
Net since admission (3/22)		**+735**	**+675**	**+700**	**+2110**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Smith, Kenneth, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *Bed #2 SICU* **Physician:** *D. Evans, MD* **Admit Date:** *3/22*

Laboratory Results

	Ref. Range	3/26 1522	3/29 1809
Chemistry			
Sodium (mEq/L)	136–145	146 !↑	140
Potassium (mEq/L)	3.5–5.1	3.4 !↓	3.7
Chloride (mEq/L)	98–107	99	99
Carbon dioxide (mEq/L)	23–29	25	26
BUN (mg/dL)	6–20	31 !↑	25 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.7 !↑	1.4 !↑
BUN/Crea ratio	10.0–20.0	18.2	15.6
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	8.8	
Glucose (mg/dL)	70–99	175 !↑	130 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	2.1 !↓	2.2
Magnesium (mg/dL)	1.5–2.4	1.9	1.5
Calcium (mg/dL)	8.6–10.2	7.4 !↓	
Osmolality (mmol/kg/H_2O)	275–295	330 !↑	297 !↑
Bilirubin, total (mg/dL)	≤1.2	0.9	
Bilirubin, direct (mg/dL)	0.3	0.15	
Protein, total (g/dL)	6–7.8	5.5 !↓	5.7 !↓
Albumin (g/dL)	3.5–5.5	1.2 !↓	1.9 !↓
Prealbumin (mg/dL)	18–35	3.4 !↓	5.0 !↓
Ammonia (μg/L)	6–47	13	
Alkaline phosphatase (U/L)	30–120	330 !↑	
ALT (U/L)	4–36	370 !↑	
AST (U/L)	0–35	220 !↑	
CPK (U/L)	30–135 F 55–170 M	180 !↑	
Lactate dehydrogenase (U/L)	208–378	650 !↑	
C-reactive protein (mg/dL)	<1.0	210 !↑	100 !↑
Cholesterol (mg/dL)	<200	170	
HDL–C (mg/dL)	>50 F, >40 M	51	
VLDL (mg/dL)	7–32	30	
LDL (mg/dL)	0–99	120	

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Smith, Kenneth, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *Bed #2 SICU* **Physician:** *D. Evans, MD* **Admit Date:** *3/22*

Laboratory Results *(Continued)*

	Ref. Range	3/26 1522	3/29 1809
LDL/HDL ratio	<4.5	2.4	
Triglycerides (mg/dL)	<150	275 !↑	235 !↑
HbA_{1C} (%)	<5.7	5.3	
Coagulation (Coag)			
PT (sec)	11–13	8 !↓	
INR	0.9–1.1	0.5 !↓	
PTT (sec)	24–34	20 !↓	
Hematology			
WBC ($\times 10^3/mm^3$)	3.9–10.7	19.1 !↑	
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	3.0 !↓	
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	11 !↓	
Hematocrit (Hct, %)	37–47 F 41–51 M	33 !↓	
Mean cell volume (μm^3)	80–96	85	
Mean cell Hgb (pg)	28–32	29	
Mean cell Hgb content (g/dL)	32–36	34	
RBC distribution (%)	11.6–16.5	12.5	
Platelet count ($\times 10^3/mm^3$)	150–350	130 !↓	
Urinalysis			
Collection method	—	catheter	
Color	—	pale yellow	
Appearance	—	cloudy	
Specific gravity	1.001–1.035	1.040 !↑	
pH	5–7	5.2	
Protein (mg/dL)	Neg	+ !↑	
Glucose (mg/dL)	Neg	+ !↑	
Ketones	Neg	+ !↑	
Blood	Neg	Neg	

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Smith, Kenneth, *Male, 25 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *Contact*
Pt. Location: *Bed #2 SICU* **Physician:** *D. Evans, MD* **Admit Date:** *3/22*

Laboratory Results *(Continued)*

	Ref. Range	3/26 1522	3/29 1809
Bilirubin	Neg	Neg	
Nitrites	Neg	Neg	
Urobilinogen (mg/dL)	<1.1	<0.1	
Leukocyte esterase	Neg	Neg	
Prot chk	Neg	Neg	
WBCs (/HPF)	0–5	0	
RBCs (/HPF)	0–2	0	
Bact	0	4 !↑	
Mucus	0	4 !↑	
Crys	0	0	
Casts (/LPF)	0	0	
Yeast	0	1 !↑	

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. The patient underwent antrectomy and billroth II reconstruction. Describe the new anatomical reconfiguration to the gastrointestinal tract and how this will impact digestion and absorption of nutrients. Which nutrients would be of concern?

2. The metabolic stress response to trauma has been described as a progression through three phases: the ebb phase, the flow phase, and finally the recovery or resolution. Define each of these and determine how they may correspond to this patient's hospital course.

3. It appears that Mr. Smith was abusing prescribed opioids for chronic back pain. What effect can opioid abuse have on the care of a trauma patient? Which of these effects did Mr. Smith experience?

II. Understanding the Nutrition Therapy

4. Metabolic stress and trauma significantly affect nutritional requirements. Describe the changes in nutrient metabolism that occur in metabolic stress. Specifically address energy requirements and changes in carbohydrate, protein, and lipid metabolism.

5. Are there specific nutrients that should be considered when designing nutrition support for a trauma patient? Explain the rationale and current recommendations regarding glutamine, arginine, and omega-3 fatty acids for this patient population.

6. Using current evidence-based guidelines, do you agree with starting EN on Mr. Smith? Why or why not?

III. Nutrition Assessment

7. Calculate and interpret the patient's BMI. What factors make assessing his actual weight difficult on a daily basis?

8. Calculate energy and protein requirements for Mr. Smith. Use at least two methods (including the Penn State) to estimate his energy needs. Explain your rationale for using each one. For the Penn State calculation, the minute ventilation is 3.0 L/minute and the maximum temperature is 40.6°C .

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

9. What does indirect calorimetry (IC) measure? Why would the RDN caring for Mr. Smith ask for a repeated IC measurement in 72 hours?

10. Compare the estimated energy needs calculated using the predictive equations with each other and with those obtained by IC measurements.

11. Acute-phase proteins are often used as a marker of the stress response. What is an acute-phase protein? What is the role of C-reactive protein in the nutritional assessment of critically ill trauma patients? What other acute-phase proteins may be followed to assess the inflammatory stress response?

12. Mr. Smith was prescribed parenteral nutrition (PN) on hospital admission day #7 for inability to advance EN beyond 25 cc/hr. The pharmacist is working with the RDN and would like recommendations for macronutrient and fluid needs for Mr. Smith. What PN recommendations would be appropriate for Mr. Smith?

13. The patient is receiving propofol at 25 cc/hr. What is this, and why should it be included in an assessment of his nutritional intake? If the propofol were to be discontinued, how would this change your recommendations in #12?

14. List abnormal biochemical values for 3/26, describe why they might be abnormal, and explain any nutrition-related implications.

IV. Nutrition Diagnosis

15. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

16. For the PES statement that you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

VI. Nutrition Monitoring and Evaluation

17. Mr. Smith has a narcotic bowel. What is a narcotic bowel and how will this impact his ability to wean off of PN?

18. What are the standard recommendations for monitoring the nutritional status of a patient receiving nutrition support? Include in your answer the monitoring parameters to assess readiness for EN advancement.

19. Hyperglycemia was noted in the laboratory results. Why is hyperglycemia of concern in the critically ill patient? What are the current recommendations for glycemic control in critically ill patients?

20. What would be the standard guidelines and subsequent recommendations to begin weaning PN and increasing enteral feeds?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Arroyo-Novoa CM, Figueroa-Ramos MI, Balas M, et al. Opioid and benzodiazepine withdrawal syndromes in trauma ICU patients: A prospective exploratory study. *Crit Care Expl*. 2020;2:e0089.

Brown B, Roehl K, Betz M. Enteral nutrition formula selection: Current evidence and implications for practice. *Nutr Clin Pract*. 2015;30:72–85.

de Vries MCH, Koekkoek KWAC, Opdam MH, et al. Nutrition assessment of critically ill patients: Validation of the modified NUTRIC score. *Eur J Clin Nutr*. 2018;72:428–435.

Doley J, Phillips W. Overview of enteral nutrition. In Mueller CM, ed. *The A.S.P.E.N. Adult Nutrition Support Core Curriculum*. 3rd ed. Silver Springs, MD: ASPEN; 2017:213–226.

Fujioka K, Jeejeebhoy K, Schneider SM, et al. Patients with short bowel on narcotics during 2 randomized trials have abdominal complaints independent of tedeglutide. *J Parenter Enteral Nutr.* 2017;41(8):1491–1422.

Hakimian JK, Dong TS, Barahona JA. Dietary supplementation with omega-3 polyunsaturated fatty acids reduces opioid-seeking behaviors and alters the gut microbiome. *Nutrients*. 2019;11(8):E1900.

Heyland DK, Elke G, Cook D, et al. Glutamine and antioxidants in the critically ill patient: A post hoc analysis of a large-scale randomized trial. *JPEN J Parenter Enteral Nutr*. 2015;39(4):401–409. doi:10.1177/0148607114529994.

Karamchandani K, Klick J, Dougherty L, Bonavia A, Allen SR, Carr ZJ. Pain management in trauma patients affected by the opioid epidemic. *J Trauma Acute Care Surg*. 2019;87(2):430–439.

Kogan S, Sood A, Garnick MS. Zinc and wound healing: A review of zinc physiology and clinical applications. *Wounds*. 2017;29(4):102–106.

Mallick-Searle T, Fillman M. The pathophysiology, incidence, impact, and treatment of opioid-induced nausea and vomiting. *J Am Assoc Nurse Pract*. 2017;29(11):704–710.

McClave SA, DiBaise JK, Mullen G, Martindale R. ACG Clinical Guideline: Nutrition therapy in the hospitalized adult. *Am J Gastroenterol*. 2016;111:315–334.

McClave SA, Taylor BE, Martindale RG, et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). *J Parenter Enteral Nutr*. 2016;40:159–211.

Orinovsky I, Raizman E. Improvement of nutritional intake in intensive care unit patients via a nurse-led enteral nutrition feeding protocol. *Crit Care Nurse*. 2018;38(3):38–44.

Parent B, Seaton M, O'Keefe G. Biochemical markers of nutrition support in critically ill trauma victims. *JPEN J Parenter Enteral Nutr*. 2018;42(2):335–342.

Sigmon SC. Additive burdens of malnutrition, poverty, and substance abuse. *Lancet*. 2016;388:1879–1880.

Singer P. Preserving the quality of life: Nutrition in the ICU. *Crit Care*. 2019;23(S1):139.

Ward EN, Quaye AN, Wilens TE. Opioid use disorders: Perioperative management of a special population. *Anesth Analg*. 2018;127(2):539–547.

Zinder R, Cooley R, Vlad LG, Molnar JA. Vitamin A and wound healing. *Nutr Clin Pract*. 2019;34(6):839–849.

Internet Resources

AND Evidence Analysis Library: http://www.andeal.org/

ASPEN American Society for Parenteral and Enteral Nutrition. www.nutritioncare.org

National Institutes of Health. National Institute on Drug Abuse: www.drugabuse.gov

Nutrition Care Manual: http://www.nutritioncaremanual.org

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 26

Sepsis and Morbid Obesity

Tom Garner is a 35-year-old obese male admitted to the MICU from the ED with probable sepsis 3 months after undergoing a Roux-en-Y gastric bypass.

Objectives

After completing this case, the student will be able to:

1. Identify the current surgical procedures used for bariatric surgery.
2. Identify the physiological consequences of bariatric surgery.
3. Describe the pathophysiology of sepsis.
4. Apply evidence-based guidelines for provision of nutrition support in the morbidly obese patient.
5. Identify specific nutrients that may assist with treatment of sepsis.
6. Describe refeeding syndrome and the current recommendations for its prevention.
7. Interpret indirect calorimetry data to assist with the design of measurable goals, interventions, and strategies for monitoring and evaluation that address the nutrition diagnoses for the patient.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garner, Tom, *Male, 35 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *S. Kelley, MD* **Admit Date:** *2/23*

Gelpi/Shutterstock.com

Patient Summary: Mr. Garner has suffered from T2DM, hyperlipidemia, gastroesophageal reflux disease, and sleep apnea over the previous 10 years. Mr. Garner has weighed over 200 lbs since age 18 with steady weight gain since that time. He had attempted to lose weight numerous times but the most weight he ever lost was 25 lbs, which she eventually regained. He had recently reached his highest weight of 375 lbs, lost 30 lbs prior to his planned bariatric surgery through the preoperative nutrition education program, and then had the Roux-en-Y gastric bypass surgery 3 months ago. He has done well at home with a total weight loss of approximately 80 lbs to date. Now, however, he is admitted to the MICU from the ED with probable sepsis.

History:

Onset of disease: Experienced flu-like symptoms over previous 48 hours and then became acutely short of breath—brought to ED at that time.
Medical history: T2DM, hyperlipidemia, gastroesophageal reflux disease, and sleep apnea
Surgical history: s/p Roux-en-Y gastric bypass December 1
Medications at home: Atorvastatin 80 mg/day (previously on insulin glargine and metformin—off diabetes medications for 2 months)
Tobacco use: ½ pack per day
Alcohol use: Socially, 1–2 drinks per week
Family history: Father: T2DM, CAD, HTN, COPD; Mother: T2DM, CAD, osteoporosis

Demographics:

Marital status: Single
Number of children: 0
Years education: Associate's degree
Language: English only
Occupation: Office manager for real estate office
Hours of work: 8–5 daily—sometimes on weekends
Household members: Lives with roommate
Ethnicity: Caucasian
Religious affiliation: None stated

Admitting History/Physical:

Chief complaint: On mechanical ventilation
General appearance: Obese male

Vital Signs:

Temp: 102.5°F	Pulse: 98	Resp rate: 23
BP: 135/90	Height: 5'7"	Weight: 265 lbs

HEENT: Head: normocephalic and atraumatic
Eyes: PERRLA
Ears: clear
Nose: WNL
Throat: dry mucous membranes without exudates or lesions

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garner, Tom, *Male, 35 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *S. Kelley, MD* **Admit Date:** *2/23*

Cardiac: Elevated rate, regular rhythm, normal heart; diminished distal pulses. Exam reveals no gallop and no friction rub.
Pulmonary/Chest: Respirations rapid with rales
Abdominal: Obese, soft, nontender
Extremities: Ecchymosis, abrasions, petechiae on lower extremities, 2 + pitting edema, diminished pulses bilaterally
Neurological: Intubated, sedated. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Warm, dry to touch
Psychiatric: Appropriate mood and affect for clinical situation

Nursing Assessment	**2/23**
Abdominal appearance (concave, flat, rounded, obese, distended)	obese
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	light brown
Stool consistency	formed
Tubes/ostomies	NA
Genitourinary	
Urinary continence	NA
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	clear, yellow
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD1=cold, M=moist, H=hot)	W, M
Skin turgor (good, fair, poor, TENT=tenting)	good
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	EC, A, R

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garner, Tom, *Male, 35 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *S. Kelley, MD* **Admit Date:** *2/23*

Nursing Assessment *(Continued)*

Nursing Assessment	2/23
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	12

Orders:

Initiate Sepsis Bundle Orders
Nursing orders:
Central line placement; arterial line placement—arterial line care per protocol
Insert peripheral IV and maintain venous access
If SBP <90 mm Hg or MAP <65 mm Hg or lactate > 4 mmol/L: norepinephrine 2 mcg/min; dopamine 5 mcg/kg/min; epinephrine 1 mcg/min
Normal saline 500 mL bolus until CVP 8–12 mm Hg, then continue at 150 mL/hr
Vital signs q 1 hr with continuous pulse oximetry
Strict Intake/Output
Initiate the ICU pressure ulcer prevention protocol
Oral care q 2 hrs
Imaging orders: ECG, CT with contrast
Laboratory orders: urine culture, U/A with microscopic; peripheral blood culture × 2, serum lactate, basic metabolic panel, hepatic function panel, CBC, EDIF, platelets.
Medication orders:
Vancomycin 2 g in sodium chloride IVPB
Piperacillin-tazobactam 4.5 g in dextrose 100 mL IVPB
Nutrition orders: Insert feeding tube—nutrition consult
Metabolic study
NPO

MD Progress Note:

2/24
Subjective: Tom Garner's previous 24 hours reviewed
Vitals: Temp: 102.4°F, Pulse: 88, Resp rate: 30, BP: 108/58
Urine Output: 2750 mL

Physical Exam:
HEENT: Head: obese neck, no adenopathy, RIJ CVC in place
Eyes: PERRLA
Ears: clear
Nose: WNL
Throat: oral mucosa pink, dentition in good repair, pharynx pink without exudates

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garner, Tom, *Male, 35 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *S. Kelley, MD* **Admit Date:** *2/23*

Cardiac: Regular rate, regular rhythm, no m/r/g appreciated
Pulmonary/Chest: Coarse breath sounds bilaterally with scattered rhonchi R>L; no wheezes or crackles
Abdominal: Obese, soft, nontender
Extremities: Good radial pulses bilaterally. Ecchymosis, abrasions, petechiae on lower extremities, 2+ pitting edema
Neurological: Intubated, sedated, pupils equal and reactive to light. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Warm, dry to touch
Psychiatric: Appropriate mood and affect for clinical situation

Assessment/Plan: 35-y.o. male transferred from ED with sepsis, pneumonia.
Maintain current mechanical ventilation; cultures pending but will continue vancomycin and piperacillin-tazobactam. Sedation with midazolam and fentanyl. Initiate enteral feeding per nutrition consult.

..... S. Kelley, MD

Intake/Output

Date		**2/23 0701–2/24 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**0**	**0**	**0**	**0**
	I.V.	**1550**	**1200**	**1200**	**3950**
	(mL/kg/hr)	(1.60)	(1.24)	(1.24)	(1.37)
	I.V. piggyback	**250**	**250**	**250**	**750**
	PN	**0**	**0**	**0**	**0**
	Total intake	**1800**	**1450**	**1450**	**4700**
	(mL/kg)	(14.9)	(12.03)	(12.03)	(39.0)
OUT	Urine	**1000**	**800**	**950**	**2750**
	(mL/kg/hr)	(0.10)	(0.83)	(0.99)	(0.95)
	Emesis output				
	Other				
	Stool				
	Total output	**1000**	**800**	**950**	**2750**
	(mL/kg)	(8.30)	(6.64)	(7.88)	(22.8)
Net I/O		**+800**	**+650**	**+500**	**+1950**
Net since admission (2/23)		**+800**	**+650**	**+500**	**+1950**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garner, Tom, *Male, 35 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *S. Kelley, MD* **Admit Date:** *2/23*

Laboratory Results

	Ref. Range	2/23 0600
Chemistry		
Sodium (mEq/L)	136–145	139
Potassium (mEq/L)	3.5–5.1	5.1
Chloride (mEq/L)	98–107	103
Carbon dioxide (mEq/L)	23–29	32 !↑
BUN (mg/dL)	6–20	31 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.4 !↑
BUN/Crea ratio	10.0–20.0	22.1 !↑
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	5.0
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	86
Glucose (mg/dL)	70–99	205 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	2.5
Magnesium (mg/dL)	1.5–2.4	1.8
Calcium (mg/dL)	8.6–10.2	8.5 !↓
Anion gap (mmol/L)	10–20	13
Osmolality (mmol/kg/H_2O)	275–295	296 !↑
Bilirubin, total (mg/dL)	≤1.2	1.4 !↑
Bilirubin, direct (mg/dL)	<0.3	0.5 !↑
Protein, total (g/dL)	6–7.8	5.2 !↓
Albumin (g/dL)	3.5–5.5	1.8 !↓
Prealbumin (mg/dL)	18–35	13 !↓
Ammonia (µg/L)	6–47	39
Alkaline phosphatase (U/L)	30–120	143 !↑
ALT (U/L)	4–36	45 !↑
AST (U/L)	0–35	53 !↑
CPK (U/L)	30–135 F 55–170 M	205 !↑
Lactate dehydrogenase (U/L)	208–378	400 !↑
C-reactive protein (mg/dL)	<1.00	60 !↑

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garner, Tom, *Male, 35 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *S. Kelley, MD* **Admit Date:** *2/23*

Laboratory Results *(Continued)*

	Ref. Range	2/23 0600
Lactate (mEq/L)	0.3–2.3	4.2 !↑
Cholesterol (mg/dL)	<200	320 !↑
HDL-C (mg/dL)	>50 F, >40 M	30 !↓
VLDL (mg/dL)	7–32	50 !↑
LDL (mg/dL)	0–99	195 !↑
LDL/HDL ratio	<4.5	3.9
Triglycerides (mg/dL)	<150	220 !↑
HbA_{1C} (%)	<5.7	6.5 !↑
Coagulation (Coag)		
PT (sec)	11–13	14.8 !↑
INR	0.9–1.1	1.3 !↑
PTT (sec)	24–34	39 !↑
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	24.1 !↑
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	5.4
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	10.5 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	31.5 !↓
Platelet count ($\times 10^3/mm^3$)	150–350	200
Transferrin (mg/dL)	250–380 F 215–365 M	395 !↑
Ferritin (mg/mL)	20–120 F 20–300 M	40
Vitamin B_{12} (ng/dL)	24.4–100	30
Folate (ng/dL)	5–25	20
Urinalysis		
Collection method	—	catheter
Color	—	yellow
Appearance	—	clear

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Garner, Tom, *Male, 35 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *MICU Bed #5* **Physician:** *S. Kelley, MD* **Admit Date:** *2/23*

Laboratory Results *(Continued)*

	Ref. Range	2/23 0600
Specific gravity	1.001–1.035	1.004
pH	5–7	6.9
Protein (mg/dL)	Neg	+ !↑
Glucose (mg/dL)	Neg	+ !↑
Ketones	Neg	+ !↑
Blood	Neg	Neg
Bilirubin	Neg	Neg
Nitrites	Neg	Neg
Urobilinogen (mg/dL)	<1.0	0.3
Leukocyte esterase	Neg	Neg
Prot chk	Neg	Neg
WBCs (/HPF)	0–5	2
RBCs (/HPF)	0–2	1
Bact	0	+ !↑
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Pathophysiology

1. Mr. Garner's admission orders indicate he is being treated for probable sepsis and SIRS. Define these conditions.

2. Describe the metabolic alterations that occur as a result of sepsis and the systemic inflammatory response. Using the medical record information, identify the specific criteria that are consistent with the diagnosis of sepsis.

3. Mr. Garner had a Roux-en-Y gastric bypass 3 months ago and has lost approximately 80 lbs. Describe this procedure. Identify the most probable nutritional concerns associated with this rapid weight loss/surgical procedure.

II. Understanding the Nutrition Therapy

4. Using evidenced-based guidelines and the research literature, determine whether Mr. Garner should receive nutrition support. Address the pros/cons of PN versus EN; early enteral feeding; and full versus trophic feeding. Use this discussion to provide a rationale for your decisions.

5. How will Mr. Garner's bariatric surgery affect your recommendations for nutrition support?

6. After bariatric surgery, there is an increased risk for early and late dumping syndrome. Identify the etiology of early versus late dumping and the characteristics of each. In a patient experiencing dumping syndrome, which EN formula should be selected and why?

7. Discuss the current literature recommendations for supplementation of omega-3 fatty acids, glutamine, arginine, and antioxidants in nutrition support during sepsis.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

III. Nutrition Assessment

8. Assess Mr. Garner's height and weight. Calculate his BMI and % usual body weight. How does this compare to the expected weight loss after a Roux-en-Y gastric bypass?

9. Identify any abnormal biochemical indices and discuss the probable underlying etiology. Identify which laboratory measurements are consistent with sepsis and metabolic stress?

10. Supplementation is a critical part of postoperative care for bariatric surgery. Identify which micronutrients are of greatest concern and how the RDN should assess the need for supplementation.

11. Assess Mr. Garner's current hydration status using the first 24 hours of I/O and the nursing assessment.

12. Determine Mr. Garner's energy and protein requirements. Explain the rationale for the method you used to calculate these requirements. The metabolic study shows an average energy expenditure of 2375. How does the metabolic study compare to the energy equation you used to assess his nutritional needs?

IV. Nutrition Diagnosis

13. Select two nutrition problems and complete the PES statement for each.

14. Are you able to diagnose Mr. Garner using the proposed ASPEN/AND criteria for malnutrition? If so, describe the information you used to make this diagnosis.

V. Nutrition Intervention

15. Outline the nutrition support regimen you would recommend for Mr. Garner. This should include formula choice (and rationale) and rate initiation and advancement.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

16. Are there any micronutrients that you would recommend supplementing in this case? Why or why not? For any micronutrients that you are recommending, please provide the formulation, dose, and frequency needed.

VI. Nutrition Monitoring and Evaluation

17. Identify the steps you would take to monitor Mr. Garner's nutritional status in the intensive care unit.

18. What factors may affect his tolerance to enteral feeding?

19. Write an ADIME note for your initial inpatient nutrition assessment with nutrition support recommendations.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Arabi YM. Focus on fluid therapy and nutritional support. *Intensive Care Med*. 2018;44:2271–2273.

Belsy JB, Wira CR, Jacob V, Sather JE, Lee PJ. A review of micronutrients in sepsis: The role of thiamine, l-carnitine, vitamin C, selenium, and vitamin D. *Nutr Res Rev*. 2018;31(2):281–290.

Dellinger RP, Levy MM, Carlet JM, et al. Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2016. *Crit Care Medicine*. 2017;45:486–552.

De Waele E, Honoré PM, Malbrain MLNG. Does the use of indirect calorimetry change outcome in the ICU? Yes it does. *Curr Opin Clin Nutr Metab Care*. 2018;21(2):126–129.

Fleischmann C, Scherag A, Adhikari NKJ, et al. Assessment of the global incidence and mortality of hospital-treated sepsis: Current estimates and limitations. *Am J Respir Crit Care Med*. 2016;193:259–272.

Hung KY, Chen YM, Wang CC, et al. Insufficient nutrition and mortality risk in septic patients admitted to ICU with a focus on immune dysfunction. *Nutrients*. 2019;10(11):E367.

Jeong DH, Hong SB, Lim CM, et al. Relationship between nutrition intake and 28-day mortality using modified NUTRIC score in patients with sepsis. *Nutrients*. 11(8):E1906.

Lee PS, Lee KL, Betts JA, Law KI. Metabolic requirement of septic shock patients before and after liberation from mechanical ventilation. *JPEN J Parenter Enteral Nutr*. 2017;41(6):993–999.

Machado RR, Caruso L, Lima Pde A, Damasceno NR, Soriano FG. Nutrition therapy in sepsis: Characterization and implication for clinical prognosis. *Nutr Hosp*. 2015;32(3):1281–1288.

Marik PE, Khangoora V, Rivera R, Hooper MH, Catravas J. Hydrocortisone, vitamin C, and thiamine for the treatment of severe sepsis and septic shock: A retrospective before-after study. *Chest*. 2017;151(6):1229–1238.

McClave SA, Taylor BE, Martindale RG, et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Enteral and Parenteral Nutrition (A.S.P.E.N.). *J Parenter Enteral Nutr*. 2016;40:159–211.

Mechanick JI, Apovian C, Brethauer S, Garvey WT, et al. Clinical practice guidelines for the perioperative nutrition, metabolic and nonsurgical support of patients undergoing bariatric procedures—2019 update: Cosponsored by American Association of Clinical Endocrinologists/American College of Endocrinology, The Obesity Society, American Society for Metabolic & Bariatric Surgery, Obesity Medicine Association, and The American Society of Anaesthesiologists. *Endocrine Practice*. 2019;25(1):1–75.

Nahikian-Nelms ML. Metabolic stress and the critically ill. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:674–700.

Oshima T, Berger MM, de Waele E, et al. Indirect calorimetry in nutritional therapy. A position paper by the ICALIC study group. *Clin Nutr*. 2017;36(3):651–662.

Rahman A, Hasan RM, Agarwala R, et al. Identifying critically ill patients who will benefit the most from nutrition support: Validation of the modified NUTRIC score. *Clin Nutr*. 2016;35:158–162.

Seymour CW, Liu VX, Iwashyna TJ, et al. Assessment of clinical criteria for sepsis: For the third international consensus definition for sepsis and septic shock (Sepsis-3). *JAMA*. 2016;315:762–774.

Wischmeyer PE. Nutrition therapy in sepsis. *Crit Care Clin*. 2018;34(1):107–125.

Internet Resources

American Society for Metabolic and Bariatric Surgery: http://ASMBS.org

Nutrition Care Manual: http://www.nutritioncaremanual.org

Sepsis Alliance: http://www.sepsisalliance.org/

Surviving Sepsis Campaign: http://www.survivingsepsis.org/Pages/default.aspx

U.S. National Library of Medicine: http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001687/

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Unit Eleven

NUTRITION THERAPY FOR NEOPLASTIC DISEASE

The layperson often uses *cancer* as a name for one disease. The term *cancer,* or *neoplasm,* actually describes any condition in which cells proliferate at a rapid rate and in an unrestrained manner. Each type of cancer is a different disease with different origins and responses to therapy. It is difficult to generalize about the role of nutrition in cancer treatment, because each diagnosis is truly an individual case. However, it is obvious to any clinician participating in the care of cancer patients that nutrition problems are common.

Nutrition impacts all aspects of oncology, as evidenced by nearly 45% of cancers being preventable from diet and lifestyle and more than 80% of patients with cancer experiencing some degree of malnutrition. Nutrition problems may be some of the first symptoms the patient recognizes. Unexplained weight loss, changes in ability to taste, or a decrease in appetite are often present at diagnosis. The malignancy itself may affect not only energy requirements, but also the metabolism of nutrients.

As the patient begins therapy for a malignancy—surgery, radiation therapy, chemotherapy, immunotherapy, or bone marrow transplant—treatment side effects occur that can affect nutritional status. And as with many medical conditions, cancer patients also face significant psychosocial issues. Can nutrition make a difference? Adequate nutrition helps prevent surgical complications, meet increased energy and protein requirements, and repair and rebuild tissues—which cancer therapies often damage. Furthermore, good nutrition promotes increased tolerance of therapy and helps maintain the patient's quality of life.

Case 27 is set after therapy has been completed and the patient is in a recovery phase. Nutrition recommendations change at this stage to focus on cancer survivorship and improvement in overall health. Using the American Institute for Cancer Research and the National Cancer Institute guidelines, you will be able to help this patient focus on key nutrients that have been linked to cancer prevention. Case 28 allows you to plan nutritional care for some of the most common problems during cancer diagnosis and therapy, including the use of nutrition support. The unit closes with Case 29, which combines postoperative and chronic disease nutrition management for a complex surgical oncology patient. Together, these cases showcase the role of the RDN in delivering evidence-based, medical nutrition therapy.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 27

Breast Cancer

Emily Hill, MS, RDN, LD
The Ohio State University

Judith Jones is a 61-year-old female referred to the outpatient RDN at the university oncology clinic during her regular clinic visit.

Objectives

After completing this case, the student will be able to:

1. List the modifiable and nonmodifiable risk factors for the development of breast cancer.
2. Explain the staging for diagnosis of breast cancer.
3. Describe the current medical treatments used for breast cancer and the nutritional consequences of each treatment.
4. Interpret nutrition assessment data to inform the design of measurable survivorship goals, nutrition and physical activity interventions, and strategies for monitoring and evaluation that address the nutrition diagnoses for the survivor.
5. Apply evidence-based guidelines for provision of nutritional care for the survivor of breast cancer.
6. Identify dietary and physical activity patterns that may assist with prevention of cancer and management of other chronic health conditions using evidence-based resources.
7. Provide evidence-based recommendations for use of supplements and complementary and alternative medicine for the survivor of breast cancer.
8. Direct individuals to appropriate, evidence-based survivorship resources for continued care.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Jones, Judith, *Female, 61 y.o.*
Allergies: *NKFA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Outpatient Oncology Clinic* **Physician:** *M. Johnson* **Admit Date:** *7/8*

iStock.com/drbimages

Patient Summary: Judith Jones is a 61-year-old female who was diagnosed with breast cancer—Stage IIB Invasive Ductal Carcinoma T2N1miM0 18 months previously. She was treated with R mastectomy followed by radiation and chemotherapy. She received a TAC regimen of chemotherapy with docetaxel, doxorubicin, and cyclophosphamide every three weeks for six cycles. This was followed with radiation therapy to the chest wall. She has completed treatment and most recently completed reconstructive surgery.

History:

Onset of disease: Dx: Stage IIB Invasive Ductal Carcinoma T2N1miM0
Medical history: Type 2 diabetes mellitus (T2DM)
Surgical history: s/p R mastectomy, s/p deep inferior epigastric perforator (DIEP) flap reconstructive surgery 6 weeks prior.
Medications at home: Metformin
Tobacco use: None
Alcohol use: 1–2 × per week—white and red wine
Family history: Mother and sister—breast cancer; father—T2DM

Demographics:

Marital status: Married
Number of children: 4 children—ages 32, 30, 27, 24
Education: 4 years college
Language: English only
Occupation: Computer engineer
Hours of work: Currently not working but plans to return in the next few weeks
Household members: Husband—youngest child home for summer
Race/Ethnicity: Caucasian
Religious affiliation: Methodist

History/Physical:

Chief complaint: Here for surgical follow-up, requested to see outpatient RDN.
General appearance: Pleasant, overweight woman

Vital Signs:

Temp: 98.6°F	Pulse: 73 bpm	Resp rate: 15 bpm
BP: 127/78 mm Hg	Height: 5'5"	Weight: 175 lbs

General/Constitutional: Well-developed, well-nourished female. No acute distress.
HEENT: Head: normocephalic and atraumatic, hair evenly distributed
Eyes: visual field intact, bilateral PERRLA, anicteric sclera, noninjected conjunctiva
Ears: clear, hearing normal bilaterally
Nose: nares patent, no deformity, septal deviation, or perforation
Throat/Mouth: oral mucosa pink, moist, dentition in good repair, pharynx pink without exudates
Neck: soft, supple, no palpable masses, no lymphadenopathy, full ROM

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Jones, Judith, *Female, 61 y.o.*
Allergies: *NKFA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Outpatient Oncology Clinic* **Physician:** *M. Johnson* **Admit Date:** *7/8*

Cardiac: Regular rate and rhythm, normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Breast: R—healing post-surgical wounds. L—breast negative for discharge, lumps.
Abdominal: Abdomen soft, healing post-surgical wounds, with normoactive bowel sounds in all four quadrants. No masses, no organomegaly. Minimal guarding with no rebound or CVA tenderness.
Genitalia: Normal female.
Extremities: Normal ROM in all four extremities. No cyanosis, clubbing, or peripheral edema.
Neurological: Conscious, alert, and oriented × 4. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Skin is warm and dry, no diaphoresis. No rashes or ulcerations noted.
Psychiatric: Appropriate mood and affect for clinical situation.

Nutrition:

General: Patient reports that her usual weight prior to breast cancer diagnosis was 195 lbs. She experienced loss of appetite, nausea, vomiting, diarrhea, and mucositis during chemo treatments. She also states that she had extreme fatigue throughout both chemo and radiation. She states that she is feeling much better and her appetite "unfortunately" has returned to normal. She admits that she is glad she has lost weight and would like to continue to lose weight, stating, "I know that this will keep me healthier." Mrs. Jones is interested in changing her diet to try and keep her cancer from coming back and wants advice on how to do this. She has considered trying the ketogenic diet and wonders if this will be a good thing for her. She is not exercising yet due to the recent reconstructive surgery but would like to start something besides just walking—which she does every day with her dogs. She walks her dogs twice a day for about a half-mile each time.

24-hour recall:

AM:	1 c coffee (brewed black)
	1 c corn flake cereal
	1 c 2% milk
AM Snack:	2 c coffee (brewed black)
	Granola bar
Lunch:	¾ c tuna salad—made with egg and mayonnaise
	~ 20 wheat cracker thins
	1 can diet soda
PM:	8 oz filet mignon, grilled
	1 large baked potato with 2 tbsp butter, salt, and pepper
	2 c dinner salad with ranch-style dressing (3 tbsp)—lettuce, spinach, croutons, sliced cucumber
	1 small corn on the cob with 1 tsp butter, salt
	1 glass of Riesling white wine (~ 6 oz)
PM snack:	1 glass of Riesling white wine (~ 6 oz)
	3 oz white cheddar cheese
	~10 wheat cracker thins

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Jones, Judith, *Female, 61 y.o.*
Allergies: *NKFA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Outpatient Oncology Clinic* **Physician:** *M. Johnson* **Admit Date:** *7/8*

Food allergies/intolerances/aversions: None known
Previous nutrition therapy? Yes. *If yes, when:* Several years ago *Where?* Local diabetes association—attended diabetes classes.
Food purchase/preparation: Self and husband
Vit/min intake: Multivitamin/mineral daily

Laboratory Results

	Ref. Range	7/1 0600 (fasting)
Chemistry		
Sodium (mEq/L)	136–145	138
Potassium (mEq/L)	3.5–5.1	3.7
Chloride (mEq/L)	98–107	101
Carbon dioxide (mEq/L)	23–29	25
BUN (mg/dL)	6–20	11
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	0.8
BUN/Crea ratio	10.0–20.0	13.75
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	3.1
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	82
Glucose (mg/dL)	70–99	137 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	3.8
Magnesium (mg/dL)	1.5–2.4	1.9
Calcium (mg/dL)	8.6–10.2	9.1
Anion gap (mmol/L)	10–20	13
Osmolality (mmol/kg/H_2O)	275–295	288
Bilirubin, total (mg/dL)	≤1.2	0.7
Bilirubin, direct (mg/dL)	<0.3	0.1
Protein, total (g/dL)	6–7.8	6.9
Albumin (g/dL)	3.5–5.5	3.8
Prealbumin (mg/dL)	18–35	30
Ammonia (μg/L)	6–47	8
Alkaline phosphatase (U/L)	30–120	42
ALT (U/L)	4–36	11

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Jones, Judith, *Female, 61 y.o.*
Allergies: *NKFA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Outpatient Oncology Clinic* **Physician:** *M. Johnson* **Admit Date:** *7/8*

Laboratory Results *(Continued)*

	Ref. Range	7/1 0600 (fasting)
AST (U/L)	0–35	17
CPK (U/L)	30–135 F 55–170 M	44
Lactate dehydrogenase (U/L)	208–378	210
C-reactive protein (mg/dL)	<1.00	1.1 !↑
Cholesterol (mg/dL)	<200	210 !↑
HDL-C (mg/dL)	>50 F, >40 M	72
VLDL (mg/dL)	7–32	31
LDL (mg/dL)	0–99	107
LDL/HDL ratio	<4.5	1.48
Triglycerides (mg/dL)	<150	155 !↑
HbA_{1C} (%)	<5.7	6.8 !↑
Hematology		
WBC ($\times 10^3/mm^3$)	3.9–10.7	5.2
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	4.3
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	11.9 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	36 !↓
Platelet count ($\times 10^3/mm^3$)	150–350	201
Transferrin (mg/dL)	250–380 F 215–365 M	385 !↑
Ferritin (mg/mL)	20–120 F 20–300 M	55
Urinalysis		
Collection method	—	Clean catch
Color	—	yellow
Appearance	—	clear

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Jones, Judith, *Female, 61 y.o.*
Allergies: *NKFA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *Outpatient Oncology Clinic* **Physician:** *M. Johnson* **Admit Date:** *7/8*

Laboratory Results *(Continued)*

	Ref. Range	7/1 0600 (fasting)
Specific gravity	1.001–1.035	1.005
pH	5–7	5.9
Protein (mg/dL)	Neg	Neg
Glucose (mg/dL)	Neg	Neg
Ketones	Neg	Neg
Blood	Neg	Neg
Bilirubin	Neg	Neg
Nitrites	Neg	Neg
Urobilinogen (EU/dL)	<1.0	Neg
Leukocyte esterase	Neg	Neg
Prot chk	Neg	Neg
WBCs (/HPF)	0–5	2
RBCs (/HPF)	0–2	1
Bact	0	0
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Pathophysiology

1. Describe the incidence, prevalence, and survival estimates for breast cancer in the United States. How do these differ by demographic characteristics? How have these changed over time?

2. What are the modifiable risk factors for developing breast cancer? What are the non-modifiable (e.g., genetic and environmental) risk factors for developing breast cancer? Do these differ between pre- and post-menopausal breast cancer? Does Mrs. Jones have any of these in her history?

3. Explain Mrs. Jones's diagnosis: Stage IIB Invasive Ductal Carcinoma T2N1miM0. Specifically, discuss the type of breast cancer and the staging of her diagnosis.

4. She was treated with a chemotherapy regimen of docetaxel, doxorubicin, and cyclophosphamide. What are these medications and how does each one work?

5. Mrs. Jones was also treated with radiation therapy. What is the basic mechanism of using radiation therapy as a component of treatment for breast cancer?

6. What are the major side effects of chemotherapy and radiation therapy?

7. Mrs. Jones recently underwent reconstructive surgery. She had the deep inferior epigastric perforator (DIEP) flap reconstructive procedure. Describe this procedure.

II. Understanding the Nutrition Therapy

8. What are the general principles of nutrition therapy for a patient undergoing treatment for a neoplastic malignancy? Be sure to address nutrition therapies for the side effects of treatment as discussed in question 6.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

9. Now that Mrs. Jones has completed treatment for her breast cancer, what are the general nutrition recommendations she should follow for the prevention of cancer? What does the evidence say regarding recommendations that are specific to survivors of breast cancer?

10. What are the general nutrition therapy recommendations for management of her type 2 diabetes (T2DM)?

III. Nutrition Assessment

11. Assess Mrs. Jones's height and weight. Calculate her BMI and % usual body weight. Report her BMI category.

12. Identify any abnormal biochemical indices and discuss the probable underlying etiology.

13. Determine Mrs. Jones's energy and protein requirements. Explain the rationale for the method you used to calculate these requirements.

14. Mrs. Jones is taking metformin. What is this medication and what is the mechanism of action?

15. Will recommendations for managing T2DM impact the cancer prevention and survivorship recommendations that you discussed in question 9?

IV. Nutrition Diagnosis

16. Identify two pertinent nutrition problems and the corresponding nutrition diagnoses.

17. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

18. Identify three major dietary changes you would suggest for Mrs. Jones that would be consistent with cancer prevention and survivorship guidelines, allow for continued weight loss, and support the care of her T2DM.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

19. Mrs. Jones has asked about following a ketogenic diet to lower her risk of cancer recurrence. Describe your response to this question and provide an evidence-based rationale for your recommendation.

20. For each PES statement and incorporating your response to question 18, establish an ideal goal (based on the signs and symptoms) and appropriate intervention (based on the etiology).

21. Mrs. Jones is interested in specific vitamin, mineral, or herbal supplements that may help in cancer prevention. What would you tell her based on the evidence? Provide suggestions for resources for Mrs. Jones that would support her decision making regarding complementary and alternative medicine.

22. Mrs. Jones has asked about recommendations for physical activity. Where should she seek information about physical activity recommendations? What are the current recommendations for cancer prevention? Based upon these recommendations and her current habits, determine at least three goals for increasing her physical activity.

VI. Nutrition Monitoring and Evaluation

23. Write an ADIME note for your initial outpatient nutrition assessment and nutrition recommendations.

24. Mrs. Jones is interested in continued support and follow-up for her survivorship care. What are the recommendations for survivorship care planning and who should she talk to?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Academy of Nutrition and Dietetics Evidence Analysis Library. Oncology. https://www.andeal.org/topic.cfm?menu=5291&cat=5066. Published 2013. Accessed June 15, 2020.

Academy of Nutrition and Dietetics Nutrition Care Manual. Diabetes mellitus. https://www.nutritioncaremanual.org. Published 2020. Accessed June 15, 2020.

Academy of Nutrition and Dietetics Nutrition Care Manual. Oncology. https://www.nutritioncaremanual.org. Published 2020. Accessed June 15, 2020.

American Cancer Society. Cancer Facts & Figures 2020. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2020/cancer-facts-and-figures-2020.pdf. Published 2020. Accessed June 15, 2020.

American Cancer Society. Cancer Treatment & Survivorship Facts & Figures 2019–2021. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/cancer-treatment-and-survivorship-facts-and-figures/cancer-treatment-and-survivorship-facts-and-figures-2019-2021.pdf. Published 2019. Accessed June 15, 2020.

American Diabetes Association. Standards of medical care in diabetes—2020 Abridged for primary care providers. *Clin Diabetes*. 2020;38(1):10–38. doi:10.2337/cd20-as01

Breast Cancer. Cancer.Net. https://www.cancer.net/cancer-types/breast-cancer. Published 2020. Accessed June 15, 2020.

De Cicco P, Catani MV, Gasperi V, Sibilano M, Quaglietta M, Savini I. Nutrition and breast cancer: A literature review on prevention, treatment and recurrence. *Nutrients*. 2019;11(7). doi:10.3390/nu11071514.

Division of Cancer Prevention and Control, Centers for Disease Control and Prevention. Breast Cancer. CDC.gov. https://www.cdc.gov/cancer/breast/index.htm. Published April 23, 2020. Accessed June 15, 2020.

Evert AB, Boucher JL, Cypress M, et al. Nutrition therapy recommendations for the management of adults with diabetes. *Diabetes Care*. 2013;36(11):3821–3842. doi:10.2337/dc13-2042.

Greenlee H, DuPont-Reyes MJ, Balneaves LG, et al. Clinical practice guidelines on the evidence-based use of integrative therapies during and after breast cancer treatment. *CA Cancer J Clin*. 2017;67(3):194–232. doi:10.3322/caac.21397.

Limon-Miro AT, Lopez-Teros V, Astiazaran-Garcia H. Dietary guidelines for breast cancer patients: A critical review. *Adv Nutr Bethesda Md*. 2017;8(4):613–623. doi:10.3945/an.116.014423.

Logan J, Bourassa MW. The rationale for a role for diet and nutrition in the prevention and treatment of cancer. *Eur J Cancer Prev Off J Eur Cancer Prev Organ ECP*. 2018;27(4):406–410. doi:10.1097/CEJ.0000000000000427.

Nahikian-Nelms ML, Cohen DA. Neoplastic disease. In *Nutrition Therapy and Pathophysiology*. 4th edition. Cengage Learning; 2019:701–726.

National Cancer Institute, National Institutes of Health. NCI Dictionary of Cancer Terms. Cancer.gov. https://www.cancer.gov/publications/dictionaries/cancer-terms. Published April 2018. Accessed June 15, 2020.

Oliveira CLP, Mattingly S, Schirrmacher R, Sawyer MB, Fine EJ, Prado CM. A nutritional perspective of ketogenic diet in cancer: A narrative review. *J Acad Nutr Diet*. 2018;118(4):668–688. doi:10.1016/j.jand.2017.02.003.

Rock CL, Thomson C, Gansler T, et al. American Cancer Society guideline for diet and physical activity for cancer prevention. *CA Cancer J Clin*. Published June 9, 2020. doi:10.3322/caac.21591.

Runowicz CD, Leach CR, Henry NL, et al. American Cancer Society/American Society of Clinical Oncology Breast Cancer Survivorship Care Guideline. *J Clin Oncol Off J Am Soc Clin Oncol*. 2016;34(6):611–635. doi:10.1200/JCO.2015.64.3809.

Sanft T, Denlinger CS, Armenian S, et al. NCCN Guidelines Insights: Survivorship, Version 2.2019. *J Natl Compr Cancer Netw JNCCN*. 2019;17(7):784–794. doi:10.6004/jnccn.2019.0034.

Sausville E, Longo D. Principles of cancer treatment. In Jameson J, Fauci A, Kasper D, Hauser S, Longo D, Loscalzo J, eds. *Harrison's Principles of Internal Medicine*. 20th ed. McGraw Hill; 2018.

Siegel RL, Miller KD, Jemal A. Cancer statistics, 2020. *CA Cancer J Clin*. 2020;70(1):7–30. doi:10.3322/caac.21590.

Steele CB, Thomas CC, Henley SJ, et al. Vital signs: Trends in incidence of cancers associated with overweight and obesity—United States, 2005–2014. *MMWR Morb Mortal Wkly Rep*. 2017;66(39):1052–1058. doi:10.15585/mmwr.mm6639e1.

Terranova CO, Protani MM, Reeves MM. Overall dietary intake and prognosis after breast cancer: A systematic review. *Nutr Cancer*. 2018;70(2):153–163. doi:10.1080/01635581.2018.1412478.

U.S. Department of Agriculture and U.S. Department of Health and Human Services. *Dietary Guidelines for Americans 2015–2020*. 8th ed. https://health.gov/dietaryguidelines/2015/guidelines/. Published 2015. Accessed June 15, 2020.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

U.S. Department of Health and Human Services. *Physical Activity Guidelines for Americans,* 2nd ed. https://health.gov/paguidelines/second-edition/pdf/Physical_Activity_Guidelines_2nd_edition.pdf. Published 2018. Accessed June 15, 2020.
World Cancer Research Fund/American Institute for Cancer Research. Breast cancer survivors: How diet, nutrition and physical activity affect breast cancer survival. https://www.wcrf.org/dietandcancer/breast-cancer-survivors. Published 2018. Accessed June 15, 2020.
World Cancer Research Fund/American Institute for Cancer Research. Diet, Nutrition, Physical Activity and Cancer: A Global Perspective. dietandcancerreport.org. Published 2018. Accessed June 15, 2020.

Internet Resources

American Cancer Society: www.cancer.org
American Institute for Cancer Research: www.aicr.org
American Society of Clinical Oncology: www.cancer.net
Cancer Support Community: https://www.cancersupportcommunity.org/
National Cancer Institute: www.cancer.gov
National Coalition for Cancer Survivorship: https://www.canceradvocacy.org/
National Comprehensive Cancer Network: https://www.nccn.org/
Nutrition in Cancer Care—for Health Professionals: http://www.cancer.gov/about-cancer/treatment/side-effects/appetite-loss/nutrition-hp-pdq

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 28

Tongue Cancer Treated with Surgery, Radiation, and Chemotherapy

Originally submitted by Dena Champion, MS, RD, CNSC
Ohio State University Wexner Medical Center

Nick Seyer is a 58-year-old man who presents to his dentist for a routine cleaning. During examination, his dentist notices a small tongue mass, and Mr. Seyer admits to associated pain. His dentist refers him to an ear, nose, and throat physician, who decides to biopsy the area.

Objectives

After completing this case, the student will be able to:

1. Review the pathophysiology associated with carcinogenesis. Identify and explain the hallmarks of cancer.
2. Compare and contrast medical treatments available for cancer and the potential nutritional consequences of each.
3. Define the role of nutrition support in the treatment of and recovery from malignancy.
4. Analyze nutrition assessment data and apply malnutrition diagnostic criteria to determine the etiology and severity of malnutrition.
5. Determine nutrition diagnoses and write appropriate PES statements.
6. Evaluate the adequacy of an enteral feeding regimen for a cancer patient.
7. Develop a dietary intervention reflective of the PES statement. Outline appropriate monitoring and evaluation plans needed for dietary interventions.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Seyer, Nick, *Male 58 y.o.*
Allergies: *None* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 832* **Physician:** *H. Brown* **Admit Date:** *9/5*

Deman/Shutterstock.com

Patient Summary: The biopsy revealed a stage IV T2 N2b M0, HPV positive, squamous cell carcinoma of the right anterior tongue.

History:
Onset of disease: Odynophagia × 5–6 months
Medical history: Hypertension, which he states is well controlled.
Medications at home: Metoprolol
Tobacco use: Yes, 2 ppd; wife also smokes.
Alcohol use: Yes, 1–2 drinks most nights of the week.
Family history: What? Liver cancer. Who? Mother—died age 60.

Demographics:
Marital status: Married
Household members: Wife, age 52; son, age 18; two other sons are away at college—ages 19 and 22
Years education: Some college
Language: English only
Occupation: Contractor
Hours of work: Variable, but usually 5–6 days per week—starts as early as 6:30 a.m. and works often until after 6 p.m.
Ethnicity: Caucasian
Religious affiliation: Catholic

Admitting History/Physical:
Chief complaint: Tongue pain for several months that has progressively gotten worse. Unintentional weight loss associated with poor oral intake since onset of tongue pain. Patient describes noticing a "pimple" on his tongue approximately 5–6 months ago. He noticed that this mass seemed to slowly get worse and he began having significant pain with eating. He states this is especially true with spicy or acidic foods like salsa, hot sauce, or orange juice. He has noted an approximately 30-pound weight loss over 5–6 months. He never expected that cancer could be the cause.

Vital Signs:

Temp: 98.3°F	Pulse: 88	Resp rate: 13
BP: 132/92	Height: 6'3"	Weight: 198 lbs

HEENT: Positive for hearing loss and sore throat. Negative for ear pain, nosebleeds, congestion, hoarse voice, rhinorrhea, and sinus pain. There is no tinnitus or ear discharge.
Eyes: sunken; sclera clear without evidence of tears
Ears: clear
Nose: dry mucous membranes
Throat: dry mucous membranes, no inflammation

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Seyer, Nick, *Male 58 y.o.*
Allergies: *None* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 832* **Physician:** *H. Brown* **Admit Date:** *9/5*

Cardiac: Regular rate and rhythm. Normal S1, S2. No murmurs, rubs, or gallops.
Pulmonary/Chest: Clear to auscultation and percussion.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants. No masses, no organomegaly.
Extremities: Joints appear prominent with evidence of some muscle wasting. No edema.
Neurological: Conscious, alert, and oriented. Cranial nerves II through XII are intact grossly and symmetrically. No focal neurologic deficit.
Skin: Warm, dry
Psychiatric: Appropriate mood and affect

Orders:
Surgery consult to evaluate for possible surgical resection.
Radiation oncologist and medical oncologists consulted to evaluate for postoperative external beam radiation therapy and chemotherapy.
Nutrition consult.

H. Brown, MD

Nursing Assessment	**9/5**
Abdominal appearance (concave, flat, rounded, obese, distended)	rounded
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	brown
Stool consistency	soft
Tubes/ostomies	N/A
Genitourinary	
Urinary continence	yes
Urine source	clean catch
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	clear, yellow

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Seyer, Nick, *Male 58 y.o.*
Allergies: *None* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 832* **Physician:** *H. Brown* **Admit Date:** *9/5*

Nursing Assessment *(Continued)*

Nursing Assessment	9/5
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	W
Skin turgor (good, fair, poor, TENT=tenting)	fair
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	D
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	D
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	activity, 16

Nutrition:

General: Mr. Seyer notes decreased oral intake prior to admission that he relates to tongue pain. He has complaints of poor appetite and early satiety. No complaints of difficulty swallowing, nausea, or vomiting.

Usual dietary intake:
AM: Used to eat eggs, bacon, toast, and juice every morning, but for at least the past month he has eaten only eggs or oatmeal instead. He states that the toast is too dry and difficult to chew and the bacon isn't appealing. Juice causes significant discomfort.
Lunch: Previously, ate cold, packed lunch. This included sandwich, cold meat, or other leftovers from previous dinner; and fruit, cookies, and tea. Lately he is drinking Ensure® Max Protein or a smoothie from McDonald's®. He states drinking is easier than eating. Sometimes he doesn't eat lunch at all due to pain.
PM: He used to eat large portions of meat with a starch, vegetables, and salad. He usually drinks 2–3 beers after dinner. Lately he has found meat and salad difficult to eat. He prefers soups, mashed potatoes, etc. He is still drinking beer after dinner.

24-hour recall:

AM:	1 packet of instant oatmeal; sips of coffee
Lunch:	6 oz chicken noodle soup with 2–4 crackers
PM:	Macaroni and cheese—homemade, ½ c
Bedtime:	1 scoop of chocolate ice cream

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Seyer, Nick, *Male 58 y.o.*
Allergies: *None* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 832* **Physician:** *H. Brown* **Admit Date:** *9/5*

Food allergies/intolerances/aversions: None
Previous nutrition therapy? No
Food purchase/preparation: Wife
Vit/min intake: None. Used to take a multivitamin, but hasn't in years.

Laboratory Results

	Ref. Range	9/5 0832	9/11 0832
Chemistry			
Sodium (mEq/L)	136–145	137	136
Potassium (mEq/L)	3.5–5.1	3.8	3.6
Chloride (mEq/L)	98–107	101	99
Carbon dioxide (mEq/L)	23–29	26	25
BUN (mg/dL)	6–20	9	10
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	0.9	0.9
Glucose (mg/dL)	70–99	71	98
Phosphate, inorganic (mg/dL)	2.2–4.6	3.2	
Magnesium (mg/dL)	1.5–2.4	1.8	1.8
Calcium (mg/dL)	8.6–10.2	9.1	9.4
Bilirubin, direct (mg/dL)	<0.3	0.2	0.3 !↑
Protein, total (g/dL)	6–7.8	5.7 !↓	5.7 !↓
Albumin (g/dL)	3.5–5.5	3.1 !↓	3.0 !↓
Prealbumin (mg/dL)	18–35	15 !↓	12 !↓
Ammonia (μg/L)	6–47	11	21
Alkaline phosphatase (U/L)	30–120	101	99
ALT (U/L)	4–36	21	33
AST (U/L)	0–35	32	27
CPK (IU/L)	30–135 F 55–170 M	162	145
Lactate dehydrogenase (U/L)	208–378	300	290
Cholesterol (mg/dL)	<200	180	170
HDL-C (mg/dL)	>50 F, >40 M	47	
LDL (mg/dL)	0–99	129	

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Seyer, Nick, *Male 58 y.o.*
Allergies: *None* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 832* **Physician:** *H. Brown* **Admit Date:** *9/5*

Laboratory Results *(Continued)*

	Ref. Range	9/5 0832	9/11 0832
LDL/HDL ratio	<4.5	2.74	
Triglycerides (mg/dL)	<150	158 ↑	
Coagulation (Coag)			
PT (sec)	11–13	12	12.8
Hematology			
WBC ($\times 10^3/mm^3$)	3.9–10.7	5.2	6.9
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	4.2 !↓	4.3 !↓
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	13.5 !↓	13.9 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	38 !↓	38 !↓
Mean cell volume (μm^3)	80–96	90	86
Mean cell Hgb (pg)	28–32	32.4 !↑	32.3 !↑
Mean cell Hgb content (g/dL)	32–36	35.5	36.5 !↑
Platelet count ($\times 10^3/mm^3$)	150–350	250	232
Ferritin (mg/mL)	20–120 F 20–300 M	220	208
Hematology, Manual Diff			
Neutrophil (%)	40–70	55	65
Lymphocyte (%)	22–44	25	35
Monocyte (%)	0–7	4	5
Eosinophil (%)	0–5	0.5	0
Segs (%)	0–60	55	60
Bands (%)	0–10	4	3

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Seyer, Nick, *Male 58 y.o.*
Allergies: *None* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 832* **Physician:** *H. Brown* **Admit Date:** *9/5*

Intake/Output

Date		**9/11 0701–9/12 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	EN	**600**	**535**	**600**	**1735**
	EN flush	**50**	**50**	**50**	**150**
	(mL/kg/hr)	(0.90)	(0.81)	(0.90)	(0.87)
	I.V.	**800**	**800**	**800**	**2400**
	(mL/kg/hr)	(1.11)	(1.11)	(1.11)	(1.11)
	I.V. piggyback				
	PN				
	Total intake	**1450**	**1385**	**1450**	**4285**
	(mL/kg)	(16.11)	(15.39)	(16.11)	(47.61)
OUT	Urine	**1100**	**1700**	**900**	**3700**
	(mL/kg/hr)	(1.53)	(2.36)	(1.25)	(1.71)
	Emesis output				
	Other				
	Stool	**0**	**0**	**300**	**300**
	Total output	**1100**	**1700**	**1200**	**4000**
	(mL/kg)	(12.22)	(18.89)	(13.33)	(44.44)
Net I/O		**+350**	**−315**	**+250**	**+285**
Net since admission (9/5)		**+400**	**+85**	**+335**	**+335**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. Mr. Seyer has been diagnosed with cancer of the tongue, which is a type of head and neck cancer. Head and neck cancers are categorized by the area where they begin. Describe these primary areas.

2. The American Institute for Cancer Research outlines the impact of diet, nutrition, and physical activity for cancers of the mouth, pharynx, and larynx. Outline which factors are associated with increased and decreased cancer risk and the strength of the evidence associated with each factor. Which risk factors are likely associated with Mr. Seyer's tongue cancer?

3. Mr. Seyer's biopsy results indicated an HPV-positive tumor. What is HPV and what outcomes are associated with this type of tumor?

4. The pathology report indicates a staging of T2 N2b M0. Explain this terminology for staging malignancies. Define T, N, and M in your answer.

5. Cancer is generally treated with a combination of therapies. These can include surgery, chemotherapy, radiation, targeted therapy, immunotherapy, stem cell or bone marrow transplant, and hormone therapy. The type of malignancy and staging of the disease will, in part, determine the types of therapies that are prescribed. Define and describe each of these therapies. Briefly describe the mechanism for each.

6. Mr. Seyer had surgery for his primary cancer treatment. He underwent a partial glossectomy and right neck dissection on 9/7. Describe these surgical procedures. How may these procedures affect him nutritionally?

II. Understanding the Nutrition Therapy

7. Cancer treatment often leads to unpleasant side effects that impact the nutritional status of the patient. Identify three common side effects from cancer treatment and the evidence-based medical nutrition therapy for each side effect.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

8. What is the role of nutrition support during cancer treatment? How does this role change for end-of-life care?

III. Nutrition Assessment

9. Calculate and evaluate Mr. Seyer's %UBW and BMI.

10. Summarize your findings regarding his weight status. Classify the severity of his weight loss. What factors may have contributed to his weight loss? Explain.

11. What does the current evidence-based research tell us about the relationship between significant weight loss and prognosis in cancer patients?

12. Determine Mr. Seyer's energy, protein, and fluid requirements. Provide an explanation to support your calculations.

13. Mr. Seyer is currently receiving enteral nutrition, specifically Isosource® HN at 75 mL/hr per PEG tube.

a. Calculate the amount of energy and protein that will be provided at goal rate.

b. Assessing the information in the intake/output record, determine the actual amount of enteral nutrition he received on 9/11.

c. Compare this to his estimated nutrient requirements and describe the impact this might have on his nutritional status.

d. Using his intake and output records, compare his fluid needs to fluids received. Is he meeting his fluid requirements? How did you determine this? How do you use the output measurements to assess fluid needs?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

14. A surgical resident taking care of Mr. Seyer asks about a formula with a higher concentration of omega-3 fatty acids, antioxidants, arginine, and glutamine that could promote healing after surgery. What does the evidence indicate regarding nutritional needs for cancer patients and, in particular, nutrients to promote postoperative wound healing? Does this evidence support the continued use of Isosource HN? Why or why not? Include in your answer a description of possible enteral formulas to consider in this case and the characteristics of each.

15. Using the ASPEN/AND proposed malnutrition criteria, does Mr. Seyer have a diagnosis of malnutrition? Include all clinical signs of malnutrition noted in the patient's admission history and physical to support your answer.

16. Review the patient's chemistries upon admission. Identify all abnormal laboratory findings and describe their etiology/clinical significance for this patient.

17. Mr. Seyer has been diagnosed with a life-threatening illness. What is the definition of *terminal illness*?

18. The literature describes how a patient and his family may experience varying levels of emotional response to a terminal illness. These may include anger, denial, depression, and acceptance. How may this affect the patient's nutritional intake? How would you handle these components in your nutritional care? List three questions you might have for Mr. Seyer or his family to improve your nutrition care plan.

IV. Nutrition Diagnosis

19. Select two high-priority nutrition problems after Mr. Seyer's surgery and complete the PES statement for each.

V. Nutrition Intervention

20. For each of the PES statements you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

21. How may these interventions (from question 22) change as he progresses postoperatively? Discuss how Mr. Seyer may transition from enteral feeding to an oral diet.

22. Mr. Seyer is asking about many complementary alternative medicine (CAM) approaches to his treatment. Outline two CAM approaches and the evidence for including/excluding these from the nutrition care plan.

VI. Nutrition Monitoring and Evaluation

23. List the factors you should monitor for Mr. Seyer while he is receiving enteral nutrition therapy.

24. Mr. Seyer will receive radiation therapy and chemotherapy as an outpatient. Identify major assessment indices you would use to monitor his nutritional status once he begins therapy.

25. Mr. Seyer survives his cancer diagnosis and is asking you for dietary recommendations for cancer survivorship. What resources would you provide Mr. Seyer?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Abbott J, Teleni L, Mckavanagh D, et al. Patient-generated subjective global assessment short form (PG-SGA-SF) is a valid screening tool in chemotherapy. *Supp Care Cancer*. 2016;24:3883–3887.

Adelstein D, Gillison ML, Pfiser DG, et al. NCCN guidelines insights: Head and neck cancers, version 2.2017. *J Natl Compr Canc Netw*. 2017;15:761–770.

Barajas GDE, Vidal-Casariego A, Calleja-Fernandez A, et al. Appetite disorders in cancer patients: Impact on nutritional status and quality of life. *Appetite*. 2017;114:23–27.

Bozzetti F. Forcing the vicious circle: Sarcopenia increases toxicity, decreases response to chemotherapy and worsens with chemotherapy. *Ann Oncol*. 2017;28:2108–2118.

Boullata J, Carrera A, Harvey L, et al. ASPEN safe practices for enteral nutrition therapy. *J Parenter Enteral Nutr*. 2017;41:15–103.

Curtis LJ, Bernier P, Jeejeebhoy K, et al. Costs of hospital malnutrition. *Clin Nutr*. 2017;36:1391–1396.

Depeyre A, Pereira B, Pham-Dang N, Barthélémy I, Hennequin M. Impairments in food oral processing in patients treated for tongue cancer. *Dysphagia*. 2019;35:494–502. doi: 10.1007/s00455-019-10054-5.

De van der Schueren MAE, Laviano A, Blanchard H, et al. Systematic review and meta-analysis of the evidence for oral nutrition interventions on nutritional and clinical outcomes during chemo(radio) therapy: Current evidence and guidance of future trials. *Ann Oncol*. 2018;29:1141–1153.

Laskar SG, Swain M. HPV positive oropharyngeal cancer and treatment deintensification: How pertinent is it? *J Cancer Res Ther*. 2015;11:6–9.

Laviano A, Loverech A, Seelaender M. Assessing pathophysiology of cancer anorexia. *Curr Opin Clin Nutr Metab Care*. 2017;20:340–345.

Lilja M, Markkanen-Leppänen M, Viitasalo S, et al. Olfactory and gustatory functions after free flap reconstruction and radiotherapy for oral and pharyngeal cancer: A prospective follow-up study. *Eur Arch Otorhinolaryngol*. 2018;275(4):959–966.

Logan J, Bourassa MW. The rationale for a role for diet and nutrition in the prevention and treatment of cancer. *Eur J Cancer Prev*. 2018;27:406–410.

Mattox TW. Cancer cachexia: Cause, diagnosis, and treatment. *Nutr Clin Pract*. 2017;32:599–606.

McClave SA, Martindale RG, Vanek VW, et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Enteral and Parenteral Nutrition (A.S.P.E.N.). *JPEN J Parenter Enteral Nutr*. 2016;40:159–211.

Nahikian-Nelms ML, Cohen DA. Neoplastic disease. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:701–726.

Rosenquist R, Esteller M, Plass C. Introduction: epigenetics in cancer. *Sem Cancer Biol*. 2018;51. https://doi.org/10/1016/j.semcancer.2018.07.002.

Sapienza C, Issa JP. Diet, nutrition and cancer epigenetics. *Annu Rev Nutr*. 2016;36:665–681.

Schiessel DL, Baracos VE. Barriers to cancer nutrition therapy: Excess catabolism of muscle and adipose tissues induced by tumor products and chemotherapy. *Proc Nutr Soc*. 2018; doi: 10.1017/S0029665118000186.

Steele CB, Thomas CC, Henley J, et al. Vital signs: Trends in incidence of cancers associated with overweight and obesity—United States, 2005–2014. *MMWR*. 2017;66:1052–1058.

Trujillo EB, Dixon SW, Clahorn K, et al. Closing the gap in nutritional care at outpatient cancer centers: Ongoing initiatives of the oncology nutrition dietetic practice group. *J Acad Nutr Diet*. 2018;118: 749–761.

Internet Resources

Academy of Nutrition and Dietetics Evidence Analysis Library. Oncology evidence-based nutrition practice guidelines 2013: https://www.andeal.org/topic.cfm?cat=5067&reset=true. Accessed March 9, 2020.

Academy of Nutrition and Dietetics. Oncology. Nutrition Care Manual; 2018: www.nutritioncaremanual.org. Accessed March 9, 2020.

American Cancer Society: https://www.cancer.org/treatment.html. Revised July 2, 2018. Accessed March 9, 2020.

American Institute for Cancer Research. Cancer prevention diet: http://www.aicr.org/new-american-plate/cancer-preventive-diet-model-plate.html. Accessed March 7, 2020.

American Institute for Cancer Research. Foods that fight cancer: http://www.aicr.org/foods-that-fight-cancer/. Accessed March 7, 2020.

National Cancer Institute. Cancer statistics: https://www.cancer.gov/about-cancer/understanding. Updated April 28, 2018. Accessed March 7, 2020.

National Cancer Institute. Treatment-related side effects: https://www.cancer.gov/about-cancer/treatment/side-effects. Updated August 9, 2018. Accessed March 9, 2020.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case 29

Colorectal Cancer

Larry Spence, a 50-year-old male, is admitted with new onset abdominal pain and hematochezia. A recent colonoscopy revealed a palpable rectal mass, suspicious for rectal cancer.

Objectives

After completing this case, the student will be able to:

1. List the modifiable and nonmodifiable risk factors for the development of colorectal cancer.
2. Explain the process for diagnosing and staging colorectal cancer.
3. Describe the current medical treatments used for colorectal cancer and the nutritional consequences of each treatment.
4. Determine nutrition recommendations for survivorship while considering comorbidities.
5. Identify dietary and physical activity patterns that may assist with prevention of cancer and management of other chronic health conditions using evidence-based resources.
6. Direct individuals to appropriate, evidence-based survivorship resources for continued care.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Spence, Larry, *Male, 50 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 835* **Physician:** *T. Hinton, MD* **Admit Date:** *2/9*

iStock.com/energyy

Patient Summary: Larry Spence is an obese male with a past medical history of CAD, hypertriglyceridemia, T2DM. He underwent a screening colonoscopy 2 days ago with findings of a palpable rectal mass on DRE, approximately 3 cm above the anal verge. Pathology was positive for "multiple fragments of adenomatous colon epithelium with high grade dysplasia." He is now experiencing abdominal pain and hematochezia, which brought him to the ED.

History:

Medical history: CAD, hypertriglyceridemia, T2DM (Dx 6 months earlier)
Surgical history: None
Medications at home: Lisinopril 10 mg once daily, metformin 500 mg BID
Tobacco use: No
Alcohol use*:* 1–2 drinks per day
Family history: What? CAD Who? Father, paternal grandmother

Demographics:

Marital status: Married—lives with wife; *Spouse name:* Kelly
Number of children: 3
Years education: Master's degree
Language: English only
Occupation: Chief financial officer, banking industry
Hours of work: N/A
Ethnicity: Caucasian
Religious affiliation: Christian

Admitting History/Physical:

Chief complaint: Abdominal pain that has worsened over the past 24 hours after completing a screening colonoscopy 2 days ago. He complains of tenesmus and occasional bloody stools that have become more frequent over the last several months. Biopsy taken during the colonoscopy are positive for "multiple fragments of adenomatous colon epithelium with high grade dysplasia." He denies any weight loss. He denies a family history of colorectal cancer.
General appearance: 50-year-old male—tall, obese, in no acute distress.

Vital Signs:

Temp: 98.6°F	Pulse: 79	Resp rate: 21
BP: 132/90	Height: 6"0"	Weight: 240 lbs

HEENT: Head: normocephalic and atraumatic
Eyes: lids are normal. No scleral icterus. Pupils are equal, round, and reactive to light.
Ears: WNL
Nose: nasal congestion
Throat: soft, supple, no palpable masses

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Spence, Larry, *Male, 50 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 835* **Physician:** *T. Hinton, MD* **Admit Date:** *2/9*

Cardiac: No chest pain or dyspnea on exertion.
Pulmonary/Chest: Lungs are clear to auscultation bilaterally.
Abdominal: Abdomen soft, nontender, with normoactive bowel sounds in all four quadrants.
Extremities: Normal range of motion in all four extremities, no edema.
Neurological: Mild confusion, gait ataxia.
Skin: Warm and dry. Pt is not diaphoretic.

Nursing Assessment	**2/14**
Abdominal appearance (concave, flat, rounded, obese, distended)	obese
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	greenish brown
Stool consistency	watery
Tubes/ostomies	colostomy
Genitourinary	
Urinary continence	catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	clear, yellow
Integumentary	
Skin color	WNL
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD1=cold, M=moist, H=hot)	M
Skin turgor (good, fair, poor, TENT=tenting)	good
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15–16 = low risk, 13–14 = moderate risk, ≤12 = high risk)	activity, 15

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Spence, Larry, *Male, 50 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 835* **Physician:** *T. Hinton, MD* **Admit Date:** *2/9*

Orders:

Flexible sigmoidoscopy
CT abdomen/pelvis
Chem 24
Carcinoembryonic antigen
Urinalysis
Surgical oncology consult

Nutrition:

Meal type: Heart healthy
Intake % of meals: 100%
History: Mr. Spence reports no changes in appetite or body weight over the last several years. He does report a diagnosis of T2DM six months ago without any dietary education.
Usual dietary intake: Mr. Spence works a high-stress job and eats "on the go" for most meals. His wife cooks dinner most evenings and they eat out on the weekends. Since being diagnosed with T2DM he has eliminated all soda. Breakfast is typically McDonald's sausage and biscuit or a bacon/egg breakfast sandwich with coffee. Lunch is most often fast food, or he skips it. Dinner is meat/potato/vegetable. He loves the "charcoal taste" of grilled meats in the summer.
Food allergies/intolerances/aversions: NKA
Previous nutrition therapy? No
Food purchase/preparation: Spouse. Dines out 2–3 meals per week.
Vit/min intake: Centrum Complete 1 tablet most days

Laboratory Results

	Ref. Range	2/14 1835
Chemistry		
Sodium (mEq/L)	136–145	138
Potassium (mEq/L)	3.5–5.1	3.3 !↓
Chloride (mEq/L)	98–107	98
Carbon dioxide (mEq/L)	23–29	28
BUN (mg/dL)	6–20	29 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.4 !↑
BUN/Crea ratio	10.0–20.0	21 !↑
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	4.8

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Spence, Larry, *Male, 50 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 835* **Physician:** *T. Hinton, MD* **Admit Date:** *2/9*

Laboratory Results *(Continued)*

	Ref. Range	2/14 1835
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	55 !↓
Glucose (mg/dL)	70–99	172 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	2.3
Magnesium (mg/dL)	1.5–2.4	1.3 !↓
Calcium (mg/dL)	8.6–10.2	8.0 !↓
Osmolality (mmol/kg/H_2O)	275–295	297 !↑
Bilirubin, total (mg/dL)	≤1.2	1.1
Bilirubin, direct (mg/dL)	<0.3	0.2
Protein, total (g/dL)	6–7.8	5.6 !↓
Albumin (g/dL)	3.5–5.5	2.7 !↓
Prealbumin (mg/dL)	18–35	13 !↓
Ammonia (µg/L)	6–47	40
Alkaline phosphatase (U/L)	30–120	104
ALT (U/L)	4–36	33
AST (U/L)	0–35	20
Lactate dehydrogenase (U/L)	208–378	250
CRP (mg/L)	<1.0	10 !↑
Cholesterol (mg/dL)	<200	205 !↑
HDL-C (mg/dL)	>50 F, >40 M	37 !↓
VLDL (mg/dL)	7–32	33 !↑
LDL (mg/dL)	0–99	150 !↑
LDL/HDL ratio	<4.5	4.54 !↑
Triglycerides (mg/dL)	<150	188 !↑
HbA_{1C} (%)	<5.7	6.4 !↑
Iron (mcg/dL)	60 to 170	40 !↓
Ferritin (ng/mL)	20 to 250	18 !↓

(Continued)

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Spence, Larry, *Male, 50 y.o.*
Allergies: *NKA* **Code:** *FULL* **Isolation:** *None*
Pt. Location: *RM 835* **Physician:** *T. Hinton, MD* **Admit Date:** *2/9*

Laboratory Results *(Continued)*

	Ref. Range	2/14 1835
Hematology		
WBC ($\times 10^3$/mm^3)	3.9–10.7	10.1
RBC ($\times 10^6$/mm^3)	4.2–5.4 F 4.5–6.2 M	4.9
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	11 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	33 !↓
Platelet count ($\times 10^3$/mm^3)	150–350	245
MCV (fL)	80–100	77 !↓

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Intake/Output

Date		**2/14 0701–2/15 0700**			
Time		0701–1500	1501–2300	2301–0700	Daily total
IN	P.O.	**350**	**425**	**280**	**1055**
	I.V.	**900**	**850**	**925**	**2675**
	(mL/kg/hr)	(1.43)	(1.46)	(1.38)	(1.42)
	I.V. piggyback				
	PN				
	Total intake	**1250**	**1275**	**1205**	**3730**
	(mL/kg)	(11.5)	(11.7)	(11.0)	(34.2)
OUT	Urine	**525**	**305**	**450**	**1280**
	(mL/kg/hr)	(0.60)	(0.35)	(0.51)	(0.49)
	Emesis output				
	Colostomy	**625**	**550**	**425**	**1500**
	Total output	**1150**	**855**	**875**	**2780**
	(mL/kg)	(10.5)	(7.83)	(8.02)	(25.5)
Net I/O		**+100**	**+420**	**+330**	**+950**
Net since admission (2/09)		**+320**	**+245**	**+150**	**+490**

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Case Questions

I. Understanding the Disease and Pathophysiology

1. The American Institute for Cancer Research outlines the impact of diet, nutrition, and physical activity for colorectal cancers (CRC). Outline which factors are associated with an increased and decreased CRC risk. Include the strength of the evidence for each factor. Which risk factors are likely associated with Mr. Spence's CRC?

2. Multiple genes involved in various carcinogenesis pathways have been associated with CRC. Discuss two of these genes and their role in CRC.

3. The pathology report reveals that Mr. Spence has locally advanced rectal cancer that is currently staged as T3N0. Explain this terminology for staging malignancies. Define the TNM staging system in your answer.

4. After reviewing all imaging, the surgical oncologist determined that Mr. Spence will require preoperative, neoadjuvant chemoradiotherapy for his locally advanced rectal cancer. Describe these therapies and the nutritional implications that Mr. Spence might encounter throughout his treatment.

5. On 2/13, Mr. Spence will undergo a surgical resection of his rectum, preservation of the anus, and a diverting transverse colostomy with a goal to reverse the colostomy within 6 months. Describe this surgical procedure. What purpose will the transverse colostomy serve?

II. Understanding the Nutrition Therapy

6. Cancer treatment often leads to unpleasant side effects that impact the nutritional status of the patient. Identify three common side effects from cancer treatment and the evidence-based medical nutrition therapy for each side effect.

7. After surgery, Mr. Spence will have a colostomy. How will this impact the absorption of nutrients? What is the evidence-based medical nutrition therapy for a colostomy?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

8. Mr. Spence is started on a clear liquid diet postoperatively. He is noticing a significant amount of greenish, watery stool in his colostomy bag. What are possible etiologies for the increase in watery stool?

III. Nutrition Assessment

9. Calculate and evaluate Mr. Spence's BMI.

10. Calculate Mr. Spence's energy, protein, and fluid requirements. Explain your rationale for the weight you have used in your calculations.

11. Review Mr. Spence's postoperative intake and output records. Do you think Mr. Spence is relying on IV fluids to maintain his hydration? Why or why not?

12. Identify and assess any abnormal biochemical values associated with Mr. Spence's case.

IV. Nutrition Diagnosis

13. Select two nutrition problems and complete the PES statement for each.

V. Nutrition Intervention

14. Mr. Spence was eating well postoperatively and then abruptly declined. You meet with him to investigate this change. Mr. Spence reveals that he read body fatness is associated with increased risk of CRC and T2DM. He mentions that he is motivated to lose weight. What recommendations would you provide to Mr. Spence during cancer treatment regarding weight loss? Be sure to include recommendations that support both his cancer diagnosis and T2DM.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

15. Mr. Spence is confused about his carbohydrate needs as he was told very different recommendations for cancer survivorship and the management of his T2DM and watery colostomy output. What types of carbohydrates are recommended for each of Mr. Spence's diagnoses? What recommendations would you provide to Mr. Spence to improve his understanding? Be sure to include recommendations that support cancer survivorship, T2DM, and the presence of a colostomy.

16. It is not uncommon for patients to feel overwhelmed with education in the hospital. Outline steps you would take to assist Mr. Spence in his understanding the nutritional impact of his condition. What resources would you provide him and his wife at discharge?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Bibliography

Abbott J, Teleni L, Mckavanagh D, et al. Patient-generated subjective global assessment short form (PG-SGA-SF) is a valid screening tool in chemotherapy. *Supp Care Cancer*. 2016;24:3883–3887.

Academy of Nutrition and Dietetics Evidence Analysis Library. Oncology evidence-based nutrition practice guidelines 2013. https://www.andeal.org/topic.cfm?cat=5067&reset=true. Accessed March 9, 2020.

Barajas GDE, Vidal-Casariego A, Calleja-Fernandez A, et al. Appetite disorders in cancer patients: Impact on nutritional status and quality of life. *Appetite*. 2017;114:23–27.

Bozzetti F. Forcing the vicious circle: Sarcopenia increases toxicity, decreases response to chemotherapy and worsens with chemotherapy. *Ann Oncol*. 2017;28:2108–2118.

Cotogni P, Pedrazzoli P, de Waele E, et al. Nutritional therapy in cancer patients receiving chemoradiotherapy: Should we need stronger recommendations to act for improving outcomes? *J Cancer*. 2019;10(18):4318–4325.

De van der Schueren MAE, Laviano A, Blanchard H, et al. Systematic review and meta-analysis of the evidence for oral nutrition interventions on nutritional and clinical outcomes during chemo (radio) therapy: Current evidence and guidance of future trials. *Ann Oncol*. 2018;29:1141–1153.

Horvat N, Carlos Tavares Rocha C, Clemente Oliveira B, et al. MRI of rectal cancer: Tumor staging, imaging techniques, and management. *Radiographics*. 2019;39(2):367–387.

Logan J, Bourassa MW. The rationale for a role for diet and nutrition in the prevention and treatment of cancer. *Eur J Cancer Prev*. 2018;27:406–410.

Mattox TW. Cancer cachexia: Cause, diagnosis, and treatment. *Nutr Clin Pract*. 2017;32:599–606.

Mayer RJ. Lower gastrointestinal cancers. In Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, eds. *Harrison's Principals of Internal Medicine*, 20th ed. New York, NY: McGraw-Hill; 2018. http://accessmedicine.mhmedical.com

Nahikian-Nelms ML, Cohen DA. Neoplastic disease. In Nelms M, Sucher K. *Nutrition Therapy and Pathophysiology*. 4th ed. Belmont, CA: Cengage Learning; 2019:701–726.

Petrelli F, Trevisan F, Cabiddu M, et al. Total neoadjuvant therapy in rectal cancer: A systematic review and meta-analysis of treatment outcomes. *Ann Surg*. 2020;271(3):440–448.

Reischl S, Wilhelm DF, Neumann PA, Friess H, Martignoni ME. Peri- and postoperative nutrition in colorectal cancer patients. *Ther Umsch*. 2018;75(10):642–648.

Rosenquist R, Esteller M, Plass C. Introduction: Epigenetics in cancer. *Sem Cancer Biol*. 2018;51. https://doi.org/10/1016/j.semcancer.2018.07.002.

Schiessel DL, Baracos VE. Barriers to cancer nutrition therapy: Excess catabolism of muscle and adipose tissues induced by tumor products and chemotherapy. *Proc Nutr Soc*. 2018. doi: 10.1017/S0029665118000186.

Schwingshackl L, Schwedhelm C, Hoffmann G, et al. Food groups and risk of colorectal cancer. *Int J Cancer*. 2018;142(9):1748–1758.

Shida D, Tagawa K, Inada K, et al. Modified enhanced recovery after surgery (ERAS) protocols for patients with obstructive colorectal cancer. *BMC Surg*. 2017;17(1):18.

Song M, Chan AT. The potential role of exercise and nutrition in harnessing the immune system to improve colorectal cancer survival. *Gastroenterology*. 2018;155(3):596–600.

Steele CB, Thomas CC, Henley J, et al. Vital signs: Trends in incidence of cancers associated with overweight and obesity—United States, 2005–2014. *MMWR*. 2017;66:1052–1058.

Thanikachallam K, Khan G. Colorectal cancer and nutrition. *Nutrients*. 2019;11(1):E164.

Trujillo EB, Dixon SW, Clahorn K, et al. Closing the gap in nutritional care at outpatient cancer centers: Ongoing initiatives of the oncology nutrition dietetic practice group. *J Acad Nutr Diet*. 2018;118:749–761.

Zamora-Ros R, Barupal DK, Rothwell JA, et al. Dietary flavonoid intake and colorectal cancer risk in the European prospective investigation into cancer and nutrition (EPIC) cohort. *Int J Cancer*. 2017;140(8):1836–1844.

Internet Resources

American Cancer Society: https://www.cancer.org

American Institute for Cancer Research: http://www.aicr.org

National Cancer Institute: https://www.cancer.gov

NIH Genetics Home Reference: https://ghr.nlm.nih.gov/

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Appendix A
COMMON MEDICAL ABBREVIATIONS

AAL	anterior axillary line
ac	before meals
ACTH	adrenocorticotropic hormone
AD	Alzheimer's disease
ad lib	as desired (ad libitum)
ADA	American Diabetes Association
ADL	activities of daily living
AGA	antigliadin antibody
AIDS	acquired immunodeficiency syndrome
ALP (Alk phos)	alkaline phosphatase
ALS	amyotrophic lateral sclerosis
ALT	alanine aminotransferase
ANC	absolute neutrophil count
ANCA	antineutrophil cytoplasmic antibody
AND	Academy of Nutrition and Dietetics
AP	anterior posterior
ARDS	adult respiratory distress syndrome
ARF	acute renal failure, acute respiratory failure
ASA	acetylsalicylic acid, aspirin
ASCA	antisaccharomyces antibody
ASHD	arteriosclerotic heart disease
AST	aspartate aminotransferase
AV	arteriovenous
BANDS	neutrophils
BCAA	branched-chain amino acids
BE	barium enema
BEE	basal energy expenditure
BG	blood glucose
bid	twice a day (bis in die)
bili	bilirubin
BM	bowel movement
BMI	body mass index
BMR	basal metabolic rate
BMT	bone marrow transplant
BP (B/P)	blood pressure
BPD	bronchopulmonary dysplasia
BPH	benign prostate hypertrophy
bpm	beats per minute, breaths per minute
BS	bowel sounds, breath sounds, or blood sugar
BSA	body surface area
BUN	blood urea nitrogen
c	cup
c	with
C	centigrade
c/o	complains of
CA	cancer; carcinoma
CABG	coronary artery bypass graft
CAD	coronary artery disease
CAPD	continuous ambulatory peritoneal dialysis
cath	catheter, catheterize
CAVH	continuous arteriovenous hemofiltration
CBC	complete blood count
cc	cubic centimeter
C.C.E.	clubbing, cyanosis, or edema
CCK	cholecystokinin
CCU	coronary care unit
CDAI	Crohn's disease activity index
CDC	Centers for Disease Control and Prevention
CHD	coronary heart disease
CHF	congestive heart failure
CHI	closed head injury
CHO	carbohydrate
CHOL	cholesterol
CKD	chronic kidney disease
cm	centimeter
CNS	central nervous system
COPD	chronic obstructive pulmonary disease
CPK	creatinine phosphokinase
Cr	creatinine
CR	complete remission
CSF	cerebrospinal fluid
CT	computed tomography
CVA	cerebrovascular accident
CVD	cardiovascular disease
CVP	central venous pressure
CXR	chest X-ray
d/c	discharge
D/C	discontinue
D_5NS	dextrose, 5% in normal saline
D_5W	dextrose, 5% in water
DASH	Dietary Approaches to Stop Hypertension
DBW	desirable body weight
DCCT	Diabetes Control and Complications Trial
DKA	diabetic ketoacidosis
dL	deciliter
DM	diabetes mellitus
DRI	Dietary Reference Intake

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

DTR	deep tendon reflex
DTs	delirium tremens
DVT	deep vein thrombosis
Dx	diagnosis
ED	emergency department
e.g.	for example
ECF	extracellular fluid
ECG/EKG	electrocardiogram
EEG	electroencephalogram
EGD	esophagogastroduodenoscopy
ELISA	enzyme-linked immunosorbent assay
EMA	antiendomysial antibody
EMG	electromyography
EOMI	extra-ocular muscles intact
ERT	estrogen replacement therapy
ESR	erythrocyte sedimentation rate
F	Fahrenheit
FBG	fasting blood glucose
FBS	fasting blood sugar
FDA	Food and Drug Administration
FEF	forced mid-expiratory flow
FEV	forced-expiratory volume
FFA	free fatty acid
FH	family history
FTT	failure to thrive
FUO	fever of unknown origin
FVC	forced vital capacity
FX	fracture
g	gram
g/dL	grams per deciliter
GADA	glutamic acid decarboxylase autoantibodies
GB	gallbladder
GERD	gastroesophageal reflux disease
GFR	glomerular filtration rate
GI	gastrointestinal
GM-CSF	granulocyte/macrophage colony stimulating factor
GTF	glucose tolerance factor
GTT	glucose tolerance test
GVHD	graft versus host disease
hr	hour
H & P (HPI)	history and physical
HAV	hepatitis A virus
HbA_{1c}	glycosylated hemoglobin
HBV	hepatitis B virus
HC	head circumference
Hct	hematocrit
HCV	hepatitis C virus
HDL	high-density lipoprotein
HEENT	head, eyes, ears, nose, throat
Hg	mercury
Hgb	hemoglobin
HHNS	hyperosmolar hyperglycemic nonketotic (syndrome)
HIV	human immunodeficiency virus
HLA	human leukocyte antigen
HOB	head of bed
HR	heart rate
HS or h.s.	hours of sleep
HTN	hypertension
Hx	history
I & O (I/O)	intake and output
IA-2A	insulinoma-2-associated autoantibodies
IAA	insulin autoantibodies
ICA	islet cell cytoplasmic autoantibodies
i.e.	that is
IBD	inflammatory bowel disease
IBS	irritable bowel syndrome
IBW	ideal body weight
ICF	intracranial fluid
ICP	intracranial pressure
ICS	intercostal space
ICU	intensive care unit
IGT	impaired glucose tolerance
IM	intramuscularly
inc	incontinent
INR	international normalized ratio (in regard to prothrombin time)
IV	intravenous
J	joule
K	potassium
kcal	kilocalorie
KCl	potassium chloride
kg	kilogram
KS	Kaposi's sarcoma
KUB	kidney, ureter, bladder
L	liter
lb	pounds
LBM	lean body mass
LCT	long-chain triglyceride
LDH	lactic dehydrogenase
LES	lower esophageal sphincter
LFT	liver function test
LIGS	low intermittent gastric suction
LLD	left lateral decubitus position
LLQ	lower left quadrant
LMP	last menstrual period
LOC	level of consciousness
LP	lumbar puncture
LUQ	left upper quadrant
lytes	electrolytes
MAC	midarm circumference
MAMC	midarm muscle circumference
MAOI	monoamine oxidase inhibitor
MCHC	mean corpuscular hemoglobin concentration
MCL	midclavicular line
MCT	medium-chain triglyceride
MCV	mean corpuscular volume
mEq	milliequivalent
mg	milligram
Mg	magnesium
MI	myocardial infarction

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

mm	millimeter
mm Hg	millimeters of mercury
MNT	medical nutrition therapy
MOM	Milk of Magnesia
mOsm	milliosmol
MR	mitral regurgitation
MRI	magnetic resonance imaging
MVA	motor vehicle accident
MVI	multiple vitamin infusion
N	nitrogen
N/V	nausea and vomiting
NG	nasogastric
NH_3	ammonia
NICU	neurointensive care unit, neonatal intensive care unit
NKA	no known allergies
NKDA	no known drug allergies
NPH	neutral protamine Hagedorn insulin
NPO	nothing by mouth
NSAID	nonsteroidal antiinflammatory drug
NTG	nitroglycerin
O_2	oxygen
OA	osteoarthritis
OC	oral contraceptive
OHA	oral hypoglycemic agent
OR	operating room
ORIF	open reduction internal fixation
OT	occupational therapist
OTC	over the counter
$paCO_2$	partial pressure of dissolved carbon dioxide in arterial blood
paO_2	partial pressure of dissolved oxygen in arterial blood
pc	after meals
PCM	protein-calorie malnutrition
PD	Parkinson's disease
PE	pulmonary embolus
PED	percutaneous endoscopic duodenostomy
PEEP	positive end-expiratory pressure
PEG	percutaneous endoscopic gastrostomy
PEM	protein-energy malnutrition
PERRLA	pupils equal, round, and reactive to light and accommodation
pH	hydrogen ion concentration
PKU	phenylketonuria
PMI	point of maximum impulse
PMN	polymorphonuclear
PN	parenteral nutrition
PO	by mouth (per os)
PPD	packs per day
PPN	peripheral parenteral nutrition
prn	may be repeated as necessary (pro re nata)
pt	patient
PT	patient, physical therapy, prothrombin time
PTA	prior to admission
PTT	partial thromboplastin time
PUD	peptic ulcer disease
PVC	premature ventricular contraction
PVD	peripheral vascular disease
R/O	rule out
RA	rheumatoid arthritis
RBC	red blood cell
RBW	reference body weight
RD	registered dietitian
RDA	Recommended Dietary Allowance
RDS	respiratory distress syndrome
REE	resting energy expenditure
RLL	right lower lobe
RLQ	right lower quadrant
ROM	range of motion
ROS	review of systems
RQ	respiratory quotient
RR	respiratory rate
RUL	right upper lobe
RUQ	right upper quadrant
Rx	take, prescribe, or treat
$\overline{s}$	without
S/P	status post
SBGM	self blood glucose monitoring
SBO	small bowel obstruction
SBS	short bowel syndrome
SGOT	serum glutamic oxaloacetic transaminase (now known as AST)
SGPT	serum glutamic pyruvic transaminase (now known as ALT)
SOB	shortness of breath
SQ	subcutaneous
stat	immediately
susp	suspension
T	temperature
T & A	tonsillectomy and adenoidectomy
T, tbsp	tablespoon
t, tsp	teaspoon
T_3	triiodothyronine
T_4	thyroxine
TB	tuberculosis
TEE	total energy expenditure
TF	tube feeding
TG	triglyceride
TIA	transient ischemic attack
TIBC	total iron binding capacity
TKO	to keep open
TLC	total lymphocyte count
TNM	tumor, node, metastasis
TPN	total parenteral nutrition
TSF	triceps skinfold
TSH	thyroid stimulating hormone
TURP	transurethral resection of the prostate
UA	urinalysis
UBW	usual body weight

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

UL	Tolerable Upper Intake Level	w.a.	while awake
URI	upper respiratory infection	WBC	white blood cell
UTI	urinary tract infection	WNL	within normal limits
UUN	urine urea nitrogen	wt	weight
VLCD	very-low-calorie diet	WW	whole wheat
VOD	venous occlusive disease	y.o.	year old
VS	vital signs		

Note: Abbreviations can vary from institution to institution. Although the student will find many of the accepted variations listed in this appendix, other references may be needed to supplement this list.

Notations That Should Not Be Used[a]

Inappropriate Abbreviation(s) or Figures	Best Practices
U, u	Write "unit"
IU	Write "International Unit"
Q.D., QD, q.d., qd	Write "daily"
Q.O.D., QOD, q.o.d., qod	Write "every other day"
Trailing zero (X.0 mg)	Write "1" (do not use a trailing zero with a whole number)
Lack of leading zero (.5)	Write "0.5" (use a leading zero when recording a value less than one)
MS, MSO_4	Write "morphine sulfate"
$MgSO_4$	Write "magnesium sulfate"

[a] Joint Commission (http://www.jointcommission.org/facts_about_do_not_use_list/). Accessed August 19, 2020.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Appendix B

NORMAL VALUES FOR PHYSICAL EXAMINATION

Vital Signs

Temperature
Rectal: C = 37.6°/F = 99.6°
Oral: C = 37°/F = 98.6° (± 1°)
Axilla: C = 37.4°/F = 97.6°

Blood Pressure: average 120/80 mm Hg

Heart Rate (beats per minute)

Age	At Rest Awake	At Rest Asleep	Exercise or Fever
Newborn	100–180	80–160	≤220
1 week–3 months	100–220	80–200	≤220
3 months–2 years	80–150	70–120	≤200
2–10 years	70–110	60–90	≤200
11 years-adult	55–90	50–90	≤200

Respiratory Rate (breaths per minute)

Age	Respirations
Newborn	35
1–11 months	30
1–2 years	25
3–4 years	23
5–6 years	21
7–8 years	20
9–10 years	19
11–12 years	19
13–14 years	18
15–16 years	17
17–18 years	16–18
Adult	12–20

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Cardiac Exam: carotid pulses equal in rate, rhythm, and strength; normal heart sounds; no murmurs present

HEENT Exam (head, eyes, ears, nose, throat)
Mouth: pink, moist, symmetrical; mucosa pink, soft, moist, smooth
Gums: pink, smooth, moist; may have patchy pigmentation
Teeth: smooth, white, shiny
Tongue: medium red or pink, smooth with free mobility, top surface slightly rough
Eyes: pupils equal, round, reactive to light and accommodation
Ears: tympanic membrane taut, translucent, pearly gray; auricle smooth without lesions; meatus not swollen or occluded; cerumen dry (tan/light yellow) or moist (dark yellow/brown)
Nose: external nose symmetrical, nontender without discharge; mucosa pink; septum at the midline
Pharynx: mucosa pink and smooth
Neck: thyroid gland, lymph nodes not easily palpable or enlarged

Lungs: chest contour symmetrical; spine straight without lateral deviation; no bulging or active movement within the intercostal spaces during breathing; respirations clear to auscultation and percussion

Peripheral Vascular: normal pulse graded at 3+, which indicates that pulse is easy to palpate and not easily obliterated; pulses equal bilaterally and symmetrically

Neurological: normal orientation to people, place, time, with appropriate response and concentration

Skin: warm and dry to touch; should lift easily and return back to original position, indicating normal turgor and elasticity

Abdomen: umbilicus flat or concave, positioned midway between xyphoid process and symphysis pubis; bowel motility notes normal air and fluid movement every 5–15 seconds; graded as normal, audible, absent, hyperactive, or hypoactive

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Appendix C

ROUTINE LABORATORY TESTS WITH NUTRITIONAL IMPLICATIONS[1]

This table presents a partial listing of some uses of commonly performed lab tests that have implications for nutritional problems.

Laboratory Test	Acceptable Range	Description
Hematology		
Red blood cell (RBC) count ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	Number of RBC; aids evaluation of anemias.
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	Hemoglobin content of RBC; aids evaluation of anemias.
Hematocrit (Hct, %)	37–47 F 41–51 M	Percentage RBC in total blood volume; aids evaluation of anemias.
Mean corpuscular volume (MCV μm^3)	80–96	RBC size; helps to distinguish between microcytic and macrocytic anemias.
Mean corpuscular hemoglobin concentration (MCHC g/dL)	32–36	Hgb concentration within RBCs; helps to distinguish iron-deficiency anemia.
White blood cell (WBC) count ($\times 10^3/mm^3$)	3.9–10.7	Number of WBC; general assessment of immune function and/or presence of infection and inflammation.
Blood Chemistry		
Serum Proteins		
Total protein (g/dL)	6–7.8	Protein levels are not specific to disease or highly sensitive; they can reflect poor protein intake, illness or infections, changes in hydration or metabolism, pregnancy, or medications.
Albumin (g/dL)	3.5–5.5	May reflect chronic PEM; slow to respond to improvement or worsening of disease. Synthesis rate decreases during inflammation.
Transferrin (mg/dL)	250–380 F 215–365 M	May reflect illness, chronic PEM, or iron deficiency; slightly more sensitive to changes than albumin. Synthesis rate decreases during inflammation.
Prealbumin (mg/dL)	18–35	May reflect PEM; more responsive to health status changes than albumin or transferrin. Synthesis rate decreases during inflammation.
C-reactive protein (mg/dL)	<1.00	Acute-phase protein—indicator of inflammation or disease.
Fibrinogen (mg/dL)	160–450	Acute-phase protein—indicator of inflammation or disease.
Serum Enzymes		
Creatine kinase (CK, CPK) (U/L)	30–135 F 55–170 M	Different forms of CK are found in the muscle, brain, and heart. High blood levels may indicate heart attack, brain tissue damage, or skeletal muscle injury.
Lactate dehydrogenase (LDH) (IU/L)	208–378	LDH is found in many tissues. Specific types may be elevated after heart attack, lung damage, or liver disease.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Alkaline phosphatase (U/L)	30–120	Found in many tissues; often measured to evaluate liver function.
Aspartate aminotransferase (AST, formerly SGOT) (U/L)	0–35	Usually monitored to assess liver damage; elevated in most liver diseases. Levels are somewhat increased after tissue damage.
Alanine aminotransferase (ALT, formerly SGPT) (U/L)	4–36	Usually monitored to assess liver damage; elevated in most liver diseases. Levels are somewhat increased after tissue damage.
Serum Electrolytes		
Sodium (mEq/L)	136–145	Helps to evaluate hydration status or neuromuscular, kidney, and adrenal functions.
Potassium (mEq/L)	3.5–5.1	Helps to evaluate acid-base balance and kidney function; can detect potassium imbalances.
Chloride (mEq/L)	95–107	Helps to evaluate hydration status and detect acid-base and electrolyte imbalances.
Other		
Glucose (mg/dL)	70–99	Detects risk of glucose intolerance, diabetes mellitus, and hypoglycemia; helps to monitor diabetes treatment.
Glycosylated hemoglobin (HbA_{1c}) (%)	<5.7	Used to monitor long-term blood glucose control (average over previous 120 days).
Blood urea nitrogen (BUN) (mg/dL)	6–20	Primarily used to monitor renal function; value is altered by liver failure, dehydration, or shock.
Uric acid (mg/dL)	2.8–8.8 F 4.0–9.0 M	Used for detecting gout or changes in renal function; levels affected by age and diet; varies among different ethnic groups.
Creatinine (serum or plasma) (mg/dL)	0.6–1.1 F 0.9–1.3 M	Used to monitor renal function.
Lactate (mEq/L)	0.3–2.3	Reflective of lactic acidosis—elevated during periods of critical illness.

Note: μm = micrometer; dL = deciliter; pg = picogram; U/L = units per liter; mEq = milliequivalents

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

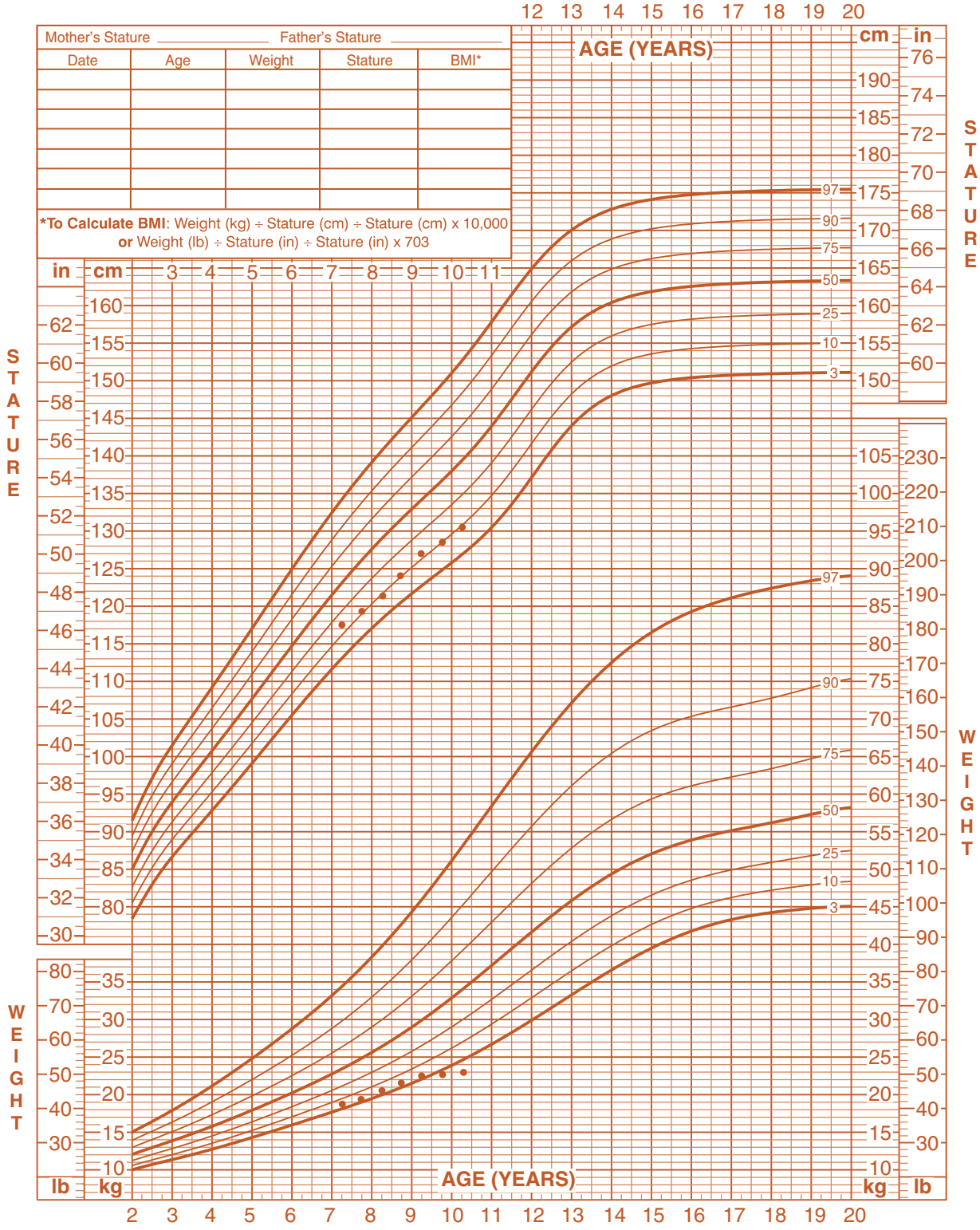
Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Appendix D

GROWTH CHARTS FOR CASE 23

Stature-for-Age and Weight-for-Age Percentiles: Girls, 2 to 20 Years

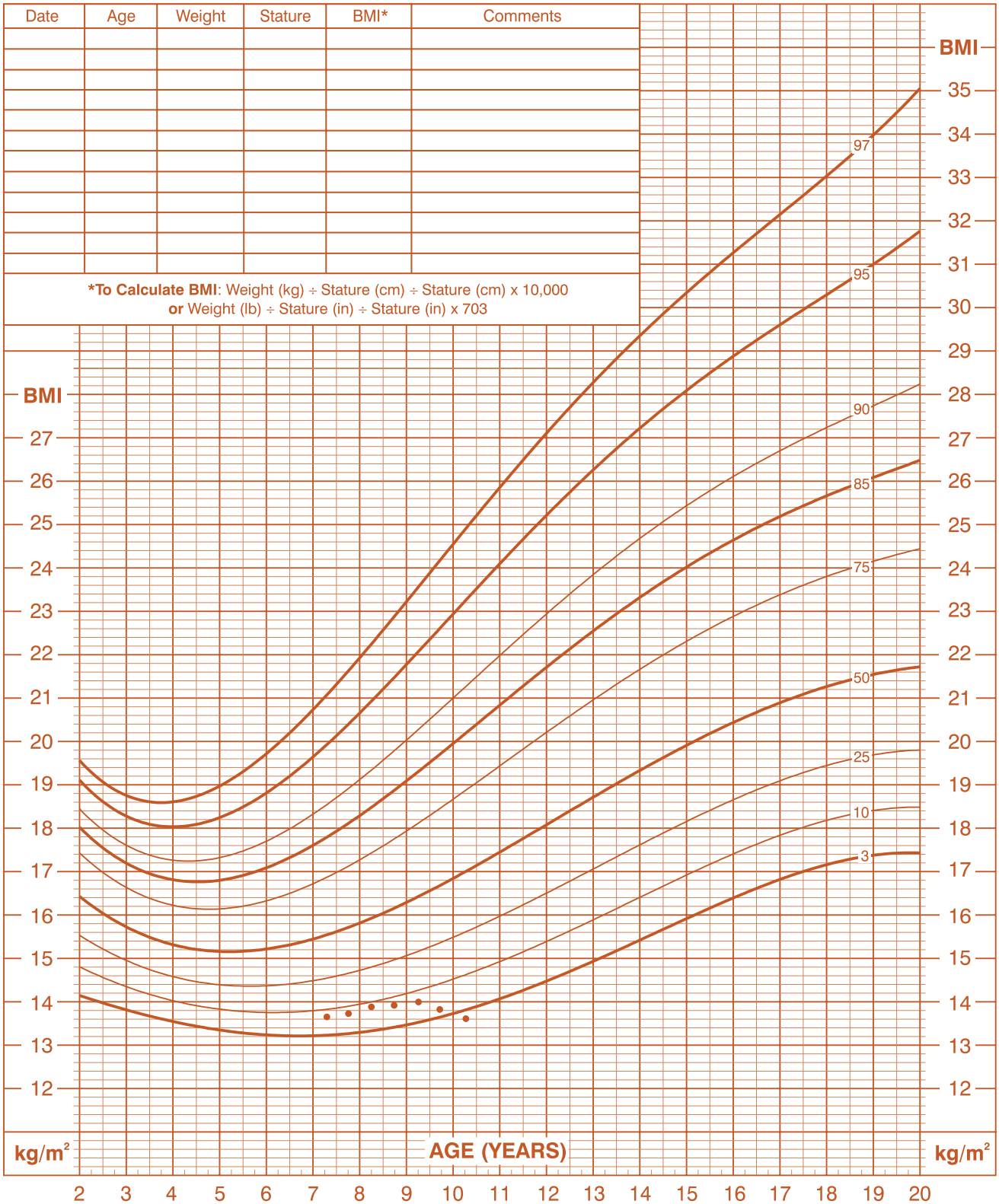


Source: Centers for Disease Control and Prevention. National Center for Health Statistics. 2000 CDC Growth Charts: United States. Available at http://www.cdc.gov/growthcharts. Accessed April 10, 2008.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Body Mass Index-for-Age Percentiles: Girls, 2 to 20 Years



Source: Centers for Disease Control and Prevention. National Center for Health Statistics. 2000 CDC Growth Charts: United States. Available at http://www.cdc.gov/growthcharts. Accessed April 10, 2008.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Appendix E

CLASS ACTIVITY: MINI-CASES

MINI-CASES 3: USE OF THE NUTRITION-FOCUSED PHYSICAL EXAM IN MALNUTRITION DIAGNOSIS

Campbell, Harry—Summary: Harry Campbell is a 68-year-old male recently diagnosed with dehydration, weight loss, generalized weakness, and malnutrition. The RDN referral was placed for evaluation and treatment of malnutrition.

Weight history: Patient states that he has lost over 60 lbs in past 1–2 years since diagnosed with squamous cell carcinoma of tongue five years ago. He states that he gets full really easily and never feels hungry. UBW: 220 lbs; Height: 6'3"; Weight: 156 lbs.

Usual intake (for past several months): AM—egg, coffee, few bites of toast; 10 a.m.—½ can Ensure Enlive®; Lunch—soup or ½ sandwich, milk; PM – few bites of soft meat, potatoes or rice. Tries to drink the other ½ can of Ensure Enlive. Eats an IDDSI level 6 diet with <5% of meals consumed. Takes sips of liquids.

Medications: multivitamin, atorvastatin, docusate capsule, fosinopril

Abnormal Laboratory Findings

Chemistry	Ref. Range	1/31
Sodium (mEq/L)	136–145	146 !↑
BUN (mg/dL)	6–20	24 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.4 !↑
Calcium (mg/dL)	8.6–10.2	8.4 !↓
Osmolality (mmol/kg/H_2O)	275–295	299 !↑
Protein, total (g/dL)	6–7.8	5.8 !↓
Albumin (g/dL)	3.5–5.5	1.8 !↓
Prealbumin (mg/dL)	18–35	9 !↓
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	9.1 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	27.1 !↓
Mean cell volume (μm^3)	80–96	100.6 !↑
Vitamin B_{12} (ng/mL)	200–900	350
Methylmelonic acid (nmol/mL)	<0.4	0.7 !↑

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Abnormal Findings on the Nutrition-Focused Physical Exam

Body Region:	Physical Findings:
Hair	Dull
Temporal region	Moderate depletion
Orbital region	Moderate depletion
Nose	Dry mucous membranes with petechiae
Mouth	Pallor, dry mucous membranes without exudates or lesions
Tongue/ Hypoglossal nerve/ glossopharyngeal	Color WNL, partial glossectomy noted, poor range of motion
Gums	Dry
Clavicle bone region	Moderate depletion
Acromion/ Shoulders	Mild depletion
Ribs/Lower back/ Midaxillary line	Moderate depletion
Scapular region	Mild depletion
Quadriceps	Mild depletion
Gastrocnemius	Mild depletion
Edema	1+ pedal edema
Skin	Warm and dry with ecchymoses, poor skin turgor

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mini-Case Questions

1. What are the differences between malnutrition associated with chronic disease and malnutrition associated with acute illness and inflammation?

2. Explain the effect of inflammation on visceral proteins and how that may impact the clinician's ability to diagnose malnutrition. What laboratory values may confirm the presence of inflammation?

3. Assess Mr. Campbell's height and weight. Calculate his BMI and % usual body weight.

4. After reading the NFPE, identify any signs or symptoms that support the diagnosis of malnutrition using the proposed definitions of malnutrition by AND/ASPEN malnutrition guidelines.

5. Identify any signs (including laboratory values) or symptoms from the NFPE that are consistent with dehydration.

6. Identify any signs (including laboratory values) or symptoms from the NFPE that are consistent with micronutrient abnormalities.

7. Determine Mr. Campbell's energy, protein, and fluid requirements. Explain the rationale for the method you used to calculate these requirements.

8. Identify the pertinent nutrition problems and the corresponding nutrition diagnoses and write a PES statement.

9. Determine the appropriate intervention for the PES statement

10. Identify the steps you would take to monitor Mr. Campbell's nutritional status.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

MINI-CASE 5: DIAGNOSIS AND IMAGING IN MYOCARDIAL INFARCTION

Garcia, Jose—Summary: Jose Garcia is a 61-year-old man admitted via STEMI protocol after a myocardial infarction s/p angioplasty of the infarct-related artery. The RDN referral was placed for a heart healthy diet education.

Onset of disease: 61-y.o. male who noted the sudden onset of severe precordial pain on the way home from work. The pain is described as pressure-like pain radiating to the jaw and left arm. The patient has noted an episode of emesis and nausea. He denies palpitations or syncope. He denies prior history of pain. He admits to smoking cigarettes (1 pack/day for 40 years). He denies hypertension, diabetes, or high cholesterol. He denies SOB.
Medical history: Not significant before this admission.
Surgical history: Surgery; cholecystectomy 10 years ago, appendectomy 30 years ago.
Medications at home: None
Hospital medications: atenolol, nitroglycerin
Allergies: Sulfa drugs
Tobacco use: 40-year history, 1 pack /day
Alcohol use: 1–2 beers per day
Family history: What? CAD. Who? Father—MI age 59.

Vital Signs:	Temp: 98.6°F	Pulse: 94	Resp rate: 23
	BP: 140/99	Height: 5'9"	Weight: 215 lbs

Abnormal Laboratory Findings

	Ref. Range	12/1 1957	12/2 0630	12/3 0645
Chemistry				
Carbon dioxide (mEq/L)	23–29	20 !↓	24	26
Glucose (mg/dL)	70–99	136 !↑	106 !↑	104 !↑
Protein, total (g/dL)	6–7.8	6.0	5.9 !↓	6.1
ALT (U/L)	4–36	30	215 !↑	185 !↑
AST (U/L)	0–35	25	245 !↑	175 !↑
CPK (U/L)	55–170 M	75	500 !↑	335 !↑
CPK-MB (U/L)	0	0	75 !↑	55 !↑
Lactate dehydrogenase (U/L)	208–378	325	685 !↑	365
Troponin I (ng/dL)	<0.2	2.4 !↑	2.8 !↑	3.1 !↑
Troponin T (ng/dL)	<0.03	2.1 !↑	2.7 !↑	3.2 !↑
Cholesterol (mg/dL)	<200	235 !↑	226 !↑	214 !↑
HDL-C (mg/dL)	>40 M	30 !↓	32 !↓	33 !↓
VLDL (mg/dL)	7–32	44 !↑	49 !↑	51 !↑
LDL (mg/dL)	0–99	160 !↑	150 !↑	141 !↑
LDL/HDL ratio	<4.5	5.3 !↑	4.7 !↑	4.3
Apo A (mg/dL)	75–160 M	72 !↓	80	98
Triglycerides (mg/dL)	<150	220 !↑	245 !↑	257 !↑

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mini-Case Questions

1. Mr. Garcia had a myocardial infarction. Explain what happened to his heart muscle and vascular system.

2. Diagnosis of cardiac disease occurs using physical, biochemical, and imaging. Compare and contrast the use of imaging technologies for the diagnosis of cardiac disease including electrocardiogram (ECG/EKG), cardiac computed tomography (CT), chest x-ray (CXR), and magnetic resonance imaging (MRI).

3. Many therapeutic interventions are available in cardiology. Explain angioplasty and stent placement. What is the purpose of this medical procedure?

4. Mr. Garcia complained of precordial pain radiating to the jaw and left arm. How do these symptoms correlate with his eventual diagnosis of a myocardial infarction? Define the differences between stable and unstable angina.

5. Mr. Garcia has several risk factors that promote the progression of atherosclerosis. Select three risk factors and describe the mechanism for increasing the risk of a myocardial infarction.

6. Examine the laboratory results for Mr. Garcia. Which labs are consistent with the MI diagnosis? Explain. Why were the levels higher on 12/2?

7. STEMI is an acronym for ST-segment elevation myocardial infarction. What is a STEMI protocol? What is the role of the RDN in a STEMI protocol?

8. As an outpatient, Mr. Garcia undergoes a repeat angiogram and is found to have disease in several vessels leading to the heart. His medical team recommends a coronary artery bypass graft. Describe this procedure. Do nutrition therapy recommendations change after this type of procedure? Explain.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

MINI-CASE 7: CULTURAL IMPACT ON NUTRITIONAL CARE

Gupta, Krishna—Summary: Krishna Gupta, a 48-year-old Indian male, visited his physician for evaluation of increasing complaints of severe indigestion/dyspepsia. Patient has been experiencing increased indigestion over the last year. Previously it was only at night, but now he experiences indigestion almost constantly. He has been taking Tums several times daily and has tried the herbs fenugreek and turmeric for relief of symptoms. Mr. Gupta has gained almost 30 lbs since he had knee surgery three years ago, which he attributes to a decrease in his ability to run and not being able to find a consistent replacement for this form of exercise. Patient states he plays with his children on the weekends, but that is the extent of his physical activity. He states he probably has been eating and drinking more over the last year, which he attributes to stress. He is worried about his family history of heart disease, which is why he takes an aspirin each day. He has not changed his diet in any way except for the addition of fenugreek and turmeric.

Usual dietary intake:	
AM:	1½ c hot cereal; 2¾ c skim milk on cereal; sometimes egg and naan 16 oz orange juice Hot tea with milk and sugar
Lunch:	Fast food burger with fries, Diet Coke® (or leftovers from previous evening)
Snack when he comes home:	Handful of crackers, cookies, or chips; 1 12-oz beer
PM:	Typically eats traditional Indian foods at home for evening meal: 3–4 oz of meat (chicken primarily) or tofu (grilled or cooked on top of stove) cooked with rice and vegetables; chapattis; hot chai or black tea. Relates that his family's schedule has been increasingly busy, so they sometimes (1–2 times per week) order pizza or stop for fast food instead of cooking.
Late PM:	Ice cream, popcorn, or crackers. Drinks 3–4 12-oz diet sodas daily as well as hot tea.
24-hr recall:	
(at home PTA):	2 scrambled eggs, naan; hot black tea
At work:	3 12-oz Diet Cokes
Lunch:	Leftover curry with spinach, chickpeas, rice—2 c Hot black tea
Late afternoon:	2 c chips, 1 beer
PM:	Lentil dal—2 c over approx. 2 c rice 2 slices naan 2 c hot chai tea
Bedtime:	2 c ice cream

Medications: Atenolol 50 mg daily; 325 mg aspirin daily; multivitamin daily; 500 mg ibuprofen twice daily for last month

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mini-Case Questions

1. Summarize the current recommendations for nutrition therapy for GERD.

2. Identify potential areas of change after assessing Mr. Gupta's usual intake and 24-hour recall.

3. Mr. Gupta and his wife are originally from India. Are there components of their traditional diet that may aggravate his symptoms of GERD?

4. What considerations related to Hinduism should you keep in mind when assessing Mr. Gupta's diet?

5. Mr. Gupta and his wife state that they have been told to use milk as a way to reduce symptoms. What would you tell them about the evidence for use?

6. Mr. Gupta's history includes the use of fenugreek and turmeric as alternative treatments for his symptoms of GERD. Examine the evidence regarding these supplements. What could you tell Mr. Gupta? Are there any concerns with the ingestion of these supplements?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

MINI-CASE 9: CELIAC DISEASE DIAGNOSTICS

Perry, Meghan—Summary: Meghan is a 3-year-old child being evaluated for symptoms of abdominal pain, diarrhea, lack of appetite, and weight loss. She has been complaining of stomach pain and has recently been refusing to eat at mealtimes. Her pediatrician refers her to the outpatient pediatric gastroenterology clinic, where she is evaluated for a possible diagnosis of celiac disease.

Medical Tx plan: IgA-tTG, total serum IgA, IgG-tTG, Chem 24, hematology with differential, upper endoscopy with biopsy, gluten-free diet, nutrition consult

Diagnostic Laboratory Values

	Ref. Range	2/13 1634
(Antibody tTG), (IgA)	<4 U/mL No antibody detected	8 U/mL !↑ Antibody detected
IgA, Serum (3–5 years)	22–140 mg/dL	60
DQ2 (DQA1 0501/0505, DQB1 02XX)	Negative	Positive !↑
DQ8 (DQA1 03XX, DQB1 0302)	Negative	Positive !↑
Vitamin D 25 hydroxy (ng/mL)	30–100	16 !↓
Iron (µg/dL)	65–165 F	39 !↓
Ferritin (ng/mL)	20–120 F	15 !↓

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Surgical Pathology Report:

A. Small bowel, second- and third-part duodenum, biopsy:
Mild to moderate villous blunting with intraepithelial lymphocytosis
B. Small bowel, duodenal bulb, biopsy:
Mild to moderate villous blunting with intraepithelial lymphocytosis

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mini-Case Questions

1. It is common to test for transglutaminase (tTg) antibodies to screen for celiac disease. The tTG IgA test has a sensitivity of 90–100%. What does this mean? It also has a specificity of 95–100%. What does this mean? Compare and contrast these values to the tTG IgG level. Which has a stronger correlation to a diagnosis of celiac disease?

2. It is recommended to test a total IgA level when ordering a tTG IgA in the event that the patient has an IgA deficiency. Meghan's serum IgA level was normal. However, in the case of a patient who truly has celiac disease and an IgA deficiency, would you expect the tTG IgA level to be low, normal, or elevated while consuming a gluten-containing diet? Why or why not?

3. Historically, the biopsy of the small intestine has been the "gold standard" for diagnosis of celiac disease. What are the histological changes that may be observed on this biopsy that correlate with the physiological changes that occur because of damage from the celiac disease? Which of these are present in Meghan's pathology report?

4. If Meghan was not consuming gluten for >3 months prior to her serologic testing and intestinal biopsy, how do you think this could have impacted her diagnosis? Why?

5. What is the role of HLA testing? Can DQ2 and DQ8 inform the presence of celiac disease? Why or why not? What is the prevalence of DQ2 and/or DQ8 in the general population?

6. Celiac disease is associated with many nongastrointestinal symptoms. List three symptoms and describe how these symptoms are utilized in the diagnosis of celiac disease.

7. Evaluate Meghan's laboratory measures for nutritional significance. What is the prevalence of iron deficiency anemia at the time of diagnosis of celiac disease? After complying with a gluten-free diet, is the risk of iron deficiency anemia eliminated? Why or why not?

8. What recommendations does the American College of Gastroenterology (ACG) and the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN) have for the role of tTG serologies and repeat endoscopy after diagnosis of celiac disease?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

MINI-CASE 16: TYPE 2 DIABETES: DIAGNOSTICS AND INTERPROFESSIONAL TEAM-BASED CARE

Fagan, Mitch—Summary: Mr. Fagan is a 53-year-old male admitted through the ED with acute hyperglycemia and HHS. He was diagnosed with T2DM one year ago but has not taken his glyburide and metformin consistently. In addition, Mr. Fagan has a medical history of hyperlipidemia and hypertension.

Medical Tx plan: Mr. Fagan is receiving acute care for HHS using NS with potassium IV fluids with regular insulin. Also, his T2DM diagnosis was confirmed with serum insulin, C-peptide, islet cell autoantibodies, and hemoglobin A1c.

Diagnostic Laboratory Values

	Ref. Range	4/12 1780	4/13 1522
Glucose (mg/dL)	70–99	855 !↑	475 !↑
HbA_{1C} (%)	<5.7	11.5 !↑	
C-peptide (ng/mL)	0.51–2.72	1.10	
ICA	—	Neg	
GADA	—	Neg	
IA-2A	—	Neg	
IAA	—	Neg	
Insulin (mIU/L)	<25 fasting 30–230: 30 mins after glucose administration 18–276: 1 hour after glucose administration 16–166: 2 hours after glucose administration ≤25: >3 hour after glucose administration	415 !↑	

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mini-Case Questions

1. Why was Mr. Fagan's diagnosis of T2DM questioned when he was admitted? Identify the laboratory tests that were completed and describe how they contribute to the confirmation of this diagnosis.

2. The members of the diabetes treatment team at University Hospital include a physician/endocrinologist (MD), nurse practitioner (DNP), registered dietitian (RDN), and pharmacist (PharmD).

a. As the RDN on the team, outline the initial questions/initial information you will want to ask/discuss with Mr. Fagan.

b. What is the training and primary role for each of the other members of the treatment team?

c. Identify 2–3 essential questions that you (as the RDN) will want to ask each member of the treatment team before you begin to plan your recommendations for Mr. Fagan.

3. Mr. Fagan will be starting on insulin for home use, which he has never used before. During day 2 of his admission, Mr. Fagan was started on glargine 19 u at 9 p.m. and then was progressed to use lispro with ICR 1:15. Are there components of insulin management that are potentially addressed by each of the team members?

4. Identify the primary topics of education that will be needed for Mr. Fagan before he is discharged. Determine who is likely the primary provider for this education. What unique contributions does the RDN provide for diabetes management for Mr. Fagan? Are there steps that could be taken to assure efficiency of his care and decrease any confusion for Mr. Fagan?

5. Mr. Fagan also has a medical history that includes hypertension and hyperlipidemia. How will these diagnoses impact your recommendations for medical nutrition therapy? What questions, as the RDN, should you ask your fellow team members about their care of these diagnoses?

6. You receive the following diet history from Mr. Fagan:

Typical intake (for past several months):

AM:	Coffee with half-and-half
Midmorning:	Bagel with cream cheese, 2–3 c of coffee
Lunch:	Out at restaurant—usually Jimmy John's or fast-food sandwich, chips, and diet soda
PM:	Cooks sometimes at home—this would be grilled chicken or beef, salad, and potatoes or rice. Often will meet friends for dinner—likes all foods and especially likes to try different ethnic foods such as Chinese, Mexican, Indian, or Thai.

Describe the use of carbohydrate counting with the ICR 1:15 for one of the meals outlined above. What would his dosage of lispro be if his preprandial glucose was within normal limits?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

MINI-CASE 17: MICRONUTRIENT MANAGEMENT IN CHRONIC KIDNEY DISEASE

Felipe, Mary—Summary: Mary Felipe is a 24 y.o. female with a history of T2DM for the previous 10 years and stage 3 CKD for the previous 3 years. Her CKD has recently progressed with declining GFR to stage 5 CKD, and she is receiving hemodialysis three times weekly. Her current GFR is estimated to be 23 mL/min/1.73 m^2.

As Mrs. Felipe's renal function declines, the normal metabolism of vitamin D, phosphorous, and calcium are impacted.

Usual dietary intake: AM—cold cereal, bread/fried potato, egg, bacon/meat, coffee. Lunch—bologna or sub sandwich, potato chips, cola; PM—chili con carne, fry bread, cola; Snacks—crackers and peanut butter

Pertinent Laboratory Findings

	Ref. Range	3/5 0700
Chemistry		
Sodium (mEq/L)	136–145	130 !↓
Potassium (mEq/L)	3.5–5.1	5.8 !↑
Chloride (mEq/L)	98–107	91 !↓
Carbon dioxide (mEq/L)	23–29	32 !↑
BUN (mg/dL)	6–20	69 !↑
Creatinine serum (mg/dL)	0.6–1.1 F	12.0 !↑
Phosphate, inorganic (mg/dL)	2.2–4.6	6.4 !↑
Calcium (mg/dL)	8.6–10.2	8.2 !↓
Albumin (g/dL)	3.5–5.5	3.3 !↓
25-OH vitamin D (ng/mL)	20–50	15 !↓
Parathyroid hormone (pg/mL)	10–55	85 !↑
Hemoglobin (Hgb, g/dL)	12–16 F	10.5 !↓
Hematocrit (Hct, %)	37–47 F	33 !↓

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation-exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mini-Case Questions

1. Describe the role of the kidney in normal vitamin D metabolism. What is the role of the parathyroid hormone in vitamin D metabolism?

2. In addition to the decline in kidney function, what other factors may contribute to a low vitamin D status for Mrs. Felipe?

3. What are the recommendations for assessing vitamin D status? What is the difference in measuring serum 25-OH vitamin D and 1,25 (OH) vitamin D?

4. What are the potential health implications of vitamin D deficiency for Mrs. Felipe? How does vitamin D deficiency impact calcium status?

5. Assess the serum calcium level above. What is the role of albumin in this assessment? How does this differ from an ionized calcium level?

6. In addition to the effects of vitamin D deficiency on calcium status, how does hyperphosphatemia impact serum calcium levels?

7. Describe the pathophysiology that occurs leading to hyperphosphatemia. What are potential contributing factors that are leading to hyperphosphatemia for Mrs. Felipe?

8. The roles of vitamin D, calcium, and phosphorus were discussed above. After reviewing this information, what supplementation, if any, would be recommended for these nutrients? Be sure to include the dose, frequency, and monitoring plan in your response.

9. After reviewing Mrs. Felipe's usual dietary intake, what dietary suggestions do you have for her to improve her status of vitamin D, calcium, and phosphorus?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

MINI-CASE 21: ETHICAL DILEMMAS IN END-OF-LIFE CARE

Choleva, Rose—Summary: Rose Choleva is a 67-year-old female with advanced Alzheimer's disease. Her disease has progressed over the last two years, requiring placement in a long-term care facility. There are no advanced directives filed for Mrs. Choleva that describe her desire for use of artificial nutrition and hydration. She is widowed and her family is struggling to decide on the use of enteral nutrition for improving her nutritional status.

Weight history: Patient has lost 15 pounds in the last 4 months, likely related to her disinterest in food and beverages. She requires supervision with all meals due to pocketing of food in her cheeks. She is easily agitated with nursing staff during mealtimes.

Usual intake (for the past several months): AM—dry toast, 2 ounces Boost®; 10 a.m.—2 ounces Boost; Lunch—pretzels or crackers, ½ sandwich with 1 slice cheese and 1 ounce of lunch meat, sips of water; 2 p.m.—2 ounces Boost, crackers; PM—chicken fingers (2 pieces), breadstick, sips of water

Abnormal Laboratory Findings

	Ref. Range	2/13 0900
Chemistry		
BUN (mg/dL)	6–20	22 !↑
Creatinine serum (mg/dL)	0.6–1.1 F 0.9–1.3 M	1.2 !↑
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	55 !↓
Calcium (mg/dL)	8.6–10.2	8.4 !↓
Osmolality (mmol/kg/H_2O)	275–295	297 !↑
Protein, total (g/dL)	6–7.8	5.1 !↓
Albumin (g/dL)	3.5–5.5	2.4 !↓
Prealbumin (mg/dL)	18–35	16.5 !↓
HDL-C (mg/dL)	>50 F, >40 M	52
Hematology		
RBC ($\times 10^6/mm^3$)	4.2–5.4 F 4.5–6.2 M	3.7 !↓
Hemoglobin (Hgb, g/dL)	12–16 F 14–17 M	10.2 !↓
Hematocrit (Hct, %)	37–47 F 41–51 M	31.5 !↓

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mini-Case Questions

1. Describe the characteristics of end-stage Alzheimer's disease that may lead to malnutrition. Which of these characteristics are present in Mrs. Choleva's case?

2. Compare and contrast the use of palliative care and hospice. How do these services differ in the delivery of artificial nutrition and hydration (ANH)?

3. Dehydration often leads to the use of IV hydration. What signs/symptoms is Mrs. Choleva experiencing that support a diagnosis of dehydration?

4. What components of the assessment will the RDN use to determine the use of ANH in a patient with advanced dementia? Consider cultural and religious considerations in the response.

5. Define the bioethical principles of autonomy, beneficence, informed consent, non-maleficence, justice and respect for persons, and the applications to nutrition support.

6. What is the role of a facility ethics committee or ethics consultation service in establishing the use of ANH? When should the medical care team consult an ethics service?

7. When ANH is withheld/withdrawn, what is the expected sequence of events until expected mortality?

8. What resources are available through the American Society for Parenteral and Enteral Nutrition to support clinicians working with families on end-of-life decisions related to ANH?

9. Mrs. Choleva's family has decided to use ANH to improve her overall nutritional status. Provide EN recommendations, including the formula, route, dose, and delivery. Provide rationale for your recommendations.

10. While on EN, Mrs. Choleva experiences an episode of aspiration pneumonia. The family decides to withdraw the use of EN. Hydration is still being prescribed intravenously. What components of the assessment will the RDN use to determine the adequacy of the IV hydration?

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

MINI-CASE 26: INDIRECT CALORIMETRY IN CRITICAL CARE

Garner, Tom—Summary: Tom Garner has suffered from T2DM, hyperlipidemia, gastroesophageal reflux disease, and sleep apnea over the previous 10 years—all secondary to his morbid obesity. He underwent a Roux-en-Y gastric bypass three months ago and is now readmitted to the MICU with sepsis on mechanical ventilation. The attending physician wants to start EN and is asking the RDN for EN recommendations.

Weight history: Mr. Garner had recently reached his highest weight of 375 lbs, lost 30 lbs prior to his planned bariatric surgery through the preoperative nutrition education program, and then had the Roux-en-Y gastric bypass surgery three months ago. He has done well at home, with a total weight loss of approximately 80 lbs to date.

Vital Signs:	Temp: 102.5°F	Pulse: 98	Resp rate: 23
	BP: 135/90	Ht: 5'7"	Wt: 265 lbs

Pertinent medications: Normal saline at 150 mL/hr, vancomycin and piperacillin-tazobactam

Metabolic Cart/Indirect Calorimetry

	2/23 1607
Metabolic Study	
Time to complete study (hrs)	3
Oxygen Concentration (%)	40
Average Energy Expenditure (kcals/day)	2375
Average Energy Expenditure/m^2 (kcals/day/m^2)	822
Average Energy Expenditure/kg (kcal/d/kg)	19.7
Average RQ	0.75
Respiratory Rate	21
Average VCO_2 (mL/min)	236
Average VO_2 (mL/min)	314
VCO_2 CV	0.7
VO_2 CV	0.7

CV = co-efficient of variance

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mini-Case Questions

1. Dr. Evans ordered a metabolic study using indirect calorimetry (IC) to assess Mr. Garner's energy needs. What is IC and how is this used in the nutrition assessment?

2. Compare and contrast the benefits of using predictive equations verses IC for estimating energy requirements.

3. According to the ASPEN/SCCM guidelines, IC is recommended in several conditions to improve the accuracy of assessing energy requirements compared to predictive equations. Do you agree with ordering a metabolic study for Mr. Garner's case? Why or why not?

4. Using IC assists in the prevention of under- and overfeeding. What are the metabolic consequences of under- and overfeeding?

5. Historically, the respiratory quotient (RQ) was used to understand substrate utilization. How should the RQ be interpreted in a metabolic study? What is the RQ indicating in Mr. Garner's metabolic study?

6. Achieving a steady state improves the accuracy of the metabolic study. What is a steady state and which measurements should the RDN assess to ensure a steady state was achieved?

7. There are several technical challenges with conducting metabolic studies that may decrease the validity of the reading. List three challenges that can impact the metabolic study.

8. Calculate Mr. Garner's energy and protein requirements. Explain the rationale for the method you used to calculate these requirements. The metabolic study shows an average energy expenditure of 2375 kcals/day. How does the metabolic study compare to the energy equation you used to assess his nutritional needs?

9. Outline the nutrition support regimen you would recommend for Mr. Garner. This should include formula choice (and rationale), rate initiation, and advancement. Indicate the total kilocalories, protein, and fluid delivered in your recommendations.

10. How often should the RDN recommend reassessing a metabolic study? Include a discussion of the metabolic stress response and the changes that occur in metabolism.

11. Discuss how the RDN and respiratory therapist can work together to improve the nutritional care of Mr. Garner.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

MINI-CASE 29: COMPLICATIONS IN RADIATION ENTERITIS

Spence, Larry—Summary: Larry Spence is a 50-year old, obese male diagnosed one year ago with advanced rectal cancer. At the time of diagnosis, his treatment included preoperative, neoadjuvant chemoradiotherapy and a surgical resection of his rectum with a diverting transverse colostomy. His colostomy was reversed six months ago, and he continues to have significant diarrhea and foul-smelling gas. He has been diagnosed with radiation enteritis and small intestinal bacterial overgrowth.

Weight history: Patient states that he has lost over 65 lbs since his initial surgery one year ago. He feels he has lost muscle mass and complains of chronic fatigue. UBW: 240 lbs; Ht: 6'0"; Wt: 174 lbs

Usual intake (for past several months): AM—scrambled eggs with cheese, 2 slices of toast with thin layer of peanut butter, decaf coffee; 10 a.m.—crackers and cheese; Lunch—baked potato, soup, or sandwich, 1 c lactose-free whole milk; PM—stew with potatoes or rice. 8 p.m.—bagel with cream cheese, 3–4 c of oral rehydration solution.

GI losses: Urine output—unsure of volume, dark yellow; stool—10 to 12 watery to soft, yellow BMs per day.

Abnormal Laboratory Values

	Ref. Range	2/14 1835
Chemistry		
BUN (mg/dL)	6–20	23 !↑
Creatinine serum (mg/dL)	0.9–1.3 M	1.5 !↑
Est GFR, non-Afr Amer (mL/min/1.73 m^2)	>60	47 !↓
Magnesium (mg/dL)	1.5–2.4	1.4 !↓
Albumin (g/dL)	3.5–5.5	2.7 !↓
Prealbumin (mg/dL)	18–35	16 !↓
Vitamin B_{12} (ng/mL)	200–900	310
Methylmelonic acid (nmol/mL)	<0.4	0.6 !↑
Hematology		
Hemoglobin (Hgb, g/dL)	14–17 M	13 !↓
Hematocrit (Hct, %)	41–51 M	39 !↓
MCV (fL)	80–100	103 !↑

Note: Values and units of measurement listed in these tables are derived from several resources. Substantial variation exists in the ranges quoted as "normal" and these may vary depending on the assay used by different laboratories.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Mini-Case Questions

1. Mr. Spence has been diagnosed with radiation enteritis and small intestinal bacterial overgrowth (SIBO). Define both of these conditions. List the factors from Mr. Spence's case that corresponds with this diagnosis.

2. Mr. Spence has a positive hydrogen breath test confirming his diagnosis of SIBO. He was treated with rifaximin for seven days. Describe how a hydrogen breath test is used in the diagnosis of SIBO. What is the role of rifaximin in the management of SIBO?

3. Mr. Spence started taking a probiotic. What evidence is there to support the use of a probiotic in Mr. Spence's case?

4. Using the proposed definitions for malnutrition by AND/ASPEN, does Mr. Spence have malnutrition? Support your answer by documenting any findings in the medical record.

5. Radiation enteritis is contributing to Mr. Spence's diarrhea. Evaluate his usual dietary intake and provide any recommendations to reduce his diarrhea and improve his nutritional status. What is the role of oral rehydration solution in the management of diarrhea?

6. Mr. Spence agrees to start taking an oral nutrition supplement. Which supplement should be recommended? Why? Provide recommendations for dosing in your response, including the dose and frequency.

7. During your interview with Mr. Spence, he reports he has been to the ED three times for dehydration or hypomagnesemia since his colostomy was taken down six months ago. With this information, would Mr. Spence benefit from nutrition support? Why or why not?

8. Micronutrient deficiencies have been reported in association with SIBO and radiation enteritis. Review the abnormal laboratory values and determine if Mr. Spence has a vitamin B_{12} deficiency. Why or why not?

9. Determine Mr. Spence's energy, protein, and fluid requirements. Explain the rationale for the method you used to calculate these requirements.

10. Identify the steps you would take to monitor Mr. Spence's nutritional status.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

INDEX

A
Abbreviations, 355–58
Abdominal gunshot wounds, 295–306
Abdominal trauma, 295–306
ABGs. *See* Arterial blood gases
Academy of Nutrition and Dietetics (AND), 1
Acute kidney injury (AKI), 195, 223–30
Acute pancreatitis, 143–56
Acute-phase proteins, 304
Admitting history
  for abdominal gunshot wound, 296
  for acute pancreatitis, 144
  for adult type 2 diabetes mellitus, 184
  for bariatric surgery, 14
  for chronic kidney disease, 198, 212–13
  for chronic obstructive pulmonary disorder, 282
  for colorectal cancer, 346
  for Crohn's disease, 120
  for ischemic stroke, 234
  for pediatric cerebral palsy, 272
  for sepsis, 308
  for tongue cancer, 334
  for traumatic brain injury, 256
Adult traumatic brain injury, 255–69
AKI. *See* Acute kidney injury
Alzheimer's disease, 245–54
American College of Gastroenterology, 96
American Institute for Cancer Research, 319, 340
American Thoracic Society, 279
Anabolism, 293
AND. *See* Academy of Nutrition and Dietetics
Anemia, 219
Arterial blood gases (ABGs)
  for acute pancreatitis, 151
  for chronic kidney disease, 204
  for chronic obstructive pulmonary disorder, 286
  for heart failure, 68
  for traumatic brain injury, 264
ASPEN. *See* American Society for Parental and Enteral Nutrition
Assessment. *See also* Nutrition assessment
  for abdominal gunshot wound, 296–99
  for acute pancreatitis, 152–53
  for adult type 1 diabetes mellitus, 175
  for adult type 2 diabetes mellitus, 185–87
  for Alzheimer's disease, 246–48
  for bariatric surgery, 14–16
  for breast cancer, 322–23
  for celiac disease, 102–3
  for childhood obesity, 5
  for chronic kidney disease, 198–200, 212–14
  for chronic obstructive pulmonary disorder, 282–83
  for gastroparesis, 90–92
  for heart failure, 64–65
  for hypertension/hyperlipidemia, 40–41
  for irritable bowel syndrome, 111
  for ischemic stroke, 235
  for malnutrition, 28–29
  for myocardial infarction, 52–55
  for nonalcoholic fatty liver disease, 135
  for pediatric cerebral palsy, 274
  for sepsis, 308–11
  for tongue cancer, 334–36
  for traumatic brain injury, 256–59, 266
American Society for Parental and Enteral Nutrition (ASPEN), 1

B
Bariatric surgery
  case study of, 13–25
  indications for, 1
BMI. *See* Body mass index
Body mass index (BMI)
  calculation of, 85
  for childhood obesity, 7–8
  of morbidly obese, 1
Braden score, 15, 54, 65, 122, 162, 186, 199, 214, 235, 247, 258, 310, 336, 347
Breast cancer, 321–31
Butterworth, C., 1

C
Cachexia, 37
Cancer
  breast, 321–31
  colorectal, 345–54
  nutrition therapy for, 319
  tongue, 333–44
Carbon dioxide, 279
Cardiac cachexia, 37
Cardiovascular disease. *See also specific diseases*
  deaths attributed to, 37
  incidence of, 37
  risk calculator for, 47
  risk factors for, 37
  types of, 37
Catabolism, 293
Celiac disease
  case study of, 101–8
  definition of, 99
  diagnosis of, 371–72

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Centers for Disease Control and Prevention, 231
Cerebral palsy, 271–78
Chemistries
  for abdominal gunshot wound, 300–301
  for acute kidney injury, 226–27
  for acute pancreatitis, 148–49
  for adult type 1 diabetes mellitus, 176–77
  for adult type 2 diabetes mellitus, 188–89
  for Alzheimer's disease, 249–50
  for bariatric surgery, 18–19
  for breast cancer, 324–25
  for celiac disease, 104
  for childhood obesity, 6
  for chronic kidney disease, 202–3, 214–16
  for chronic obstructive pulmonary disorder, 284–85
  for colorectal cancer, 348–49
  for Crohn's disease, 124–25
  description of, 361–62
  for gastroesophageal reflux disease, 81–82
  for gastroparesis, 93–94
  for heart failure, 66–68
  for hypertension/hyperlipidemia, 42–44
  for irritable bowel syndrome, 112–13
  for ischemic stroke, 237–38
  for malnutrition, 30–31
  for myocardial infarction, 55–56
  for nonalcoholic fatty liver disease, 136–37
  for pediatric cerebral palsy, 274
  for pediatric type 1 diabetes mellitus, 165–66
  for sepsis, 312–13
  for tongue cancer, 337–38
  for traumatic brain injury, 262
Childhood obesity
  cases of, 3–12
  incidence of, 1
Chronic allograft nephropathy, 211–21
Chronic disease
  of kidneys, 197–210
  malnutrition of, 27–36
  of respiratory system, 279, 281–91
Chronic kidney disease (CKD)
  dialysis for, 197–221
  hemodialysis of, 197–210
  incidence of, 195
  micronutrient management in, 375–76
  peritoneal dialysis for, 211–21
  renal transplant for, 211–21
Chronic obstructive pulmonary disease (COPD)
  case study of, 281–91
  definition of, 279
  malnutrition and, 279
CKD. *See* Chronic kidney disease
Coagulation studies
  for abdominal gunshot wound, 301
  for acute kidney injury, 227
  for acute pancreatitis, 150
  for bariatric surgery, 19
  for chronic kidney disease, 203, 216
  for Crohn's disease, 125
  for heart failure, 68
  for ischemic stroke, 238
  for nonalcoholic fatty liver disease, 137
  for sepsis, 313
  for tongue cancer, 338
  for traumatic brain injury, 263
Colorectal cancer, 345–54
Colostomy, 351–52
Congestive heart failure. *See* Heart failure
Constipation, 110
Continuous renal replacement therapy (CRRT), 229
COPD. *See* Chronic obstructive pulmonary disease
Counterregulatory hormones, 293
COVID-19, 279, 287
Critical care, indirect calorimetry in, 379–80
Crohn's disease
  case study of, 119–30
  effects of, 99
CRRT. *See* Continuous renal replacement therapy
Cytokines, 293

D

DASH. *See* Dietary Approaches to Stop Hypertension
DCCT. *See* Diabetes Control and Complications Trial
Delayed gastric emptying, 75
Diabetes Control and Complications Trial, 157, 179
Diabetes mellitus. *See also* Hyperglycemia
  adult case studies of, 173–93
  chronic kidney disease and, 196–210
  classifications of, 157
  consequences of, 157
  costs of, 157
  description of, 157
  incidence of, 157
  meal-planning for, 157
  medical nutrition therapy for, 157
  nutrition and meal planning in, 157
  pediatric case study of, 159–72
  racial predilection of, 157
  type 1. *See* Type 1 diabetes mellitus
  type 2, 183–93, 198–210, 374–75
Diabetic ketoacidosis (DKA), 191
Diagnosis. *See also* Nutrition diagnosis
  for abdominal gunshot wound, 327
  for acute kidney injury, 228
  for acute pancreatitis, 152
  for adult type 1 diabetes mellitus, 175, 179
  for adult type 2 diabetes mellitus, 187, 191
  for Alzheimer's disease, 251

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

for bariatric surgery, 21–22
for celiac disease, 103
for childhood obesity, 5
for chronic kidney disease, 218
for chronic obstructive pulmonary disorder, 287
for gastroesophageal reflux disease, 79
for gastroparesis, 91
for hypertension/hyperlipidemia, 41, 45
for irritable bowel syndrome, 114
for malnutrition, 32
for nonalcoholic fatty liver disease, 135
for pediatric cerebral palsy, 275
for pediatric type 1 diabetes mellitus, 163, 168–69
for traumatic brain injury, 265
Diarrhea, 110
Dietary Approaches to Stop Hypertension (DASH), 37
DKA. *See* Diabetic ketoacidosis
Dyslipidemia, 39–49
Dysphagia, 233–44

E
Emphysema, 279
Endocrine disorders. *See* Diabetes mellitus
End-of-life care, ethical dilemmas in, 377–78
End-stage kidney disease, 195
Essential hypertension, 37
Ethical dilemmas in end-of-life care, 377–78
Evaluation/monitoring
for abdominal gunshot wound, 305
for acute kidney injury, 229
for acute pancreatitis, 154
for adult type 1 diabetes mellitus, 180
for adult type 2 diabetes mellitus, 192
for Alzheimer's disease, 253
for bariatric surgery, 24
for breast cancer, 329
for celiac disease, 106–7
for childhood obesity, 10
for chronic kidney disease, 220
for chronic obstructive pulmonary disorder, 289–90
for Crohn's disease, 128–29
for gastroparesis, 97
for irritable bowel syndrome, 116
for ischemic stroke, 241–43
for malnutrition, 35
for myocardial infarction, 61
for nonalcoholic fatty liver disease, 141
for pediatric cerebral palsy, 277
for pediatric type 1 diabetes mellitus, 170–71
for sepsis, 317
for tongue cancer, 343
for traumatic brain injury, 267
Examination, physical
for abdominal gunshot wound, 296
for acute kidney injury, 224
for acute pancreatitis, 144–45, 148
for adult type 1 diabetes mellitus, 174–75
for adult type 2 diabetes mellitus, 184–85, 187
for Alzheimer's disease, 246–47
for bariatric surgery, 14–16
for breast cancer, 322–23
for celiac disease, 102–3
for childhood obesity, 5
for chronic kidney disease, 198–99, 212–13
for chronic obstructive pulmonary disorder, 282–83
for colorectal cancer, 346–47
for Crohn's disease, 120–21
for gastroesophageal reflux disease, 78–79
for gastroparesis, 90–91
for heart failure, 64–65
for hypertension/hyperlipidemia, 40–41
for irritable bowel syndrome, 110–11
for ischemic stroke, 234
for malnutrition, 28–29
for myocardial infarction, 52–53
for nonalcoholic fatty liver disease, 134–35
normal values for, 359–60
for pediatric cerebral palsy, 272–73
for pediatric type 1 diabetes mellitus, 160–61, 163
for sepsis, 308–11
for tongue cancer, 334–35
for traumatic brain injury, 256–57, 259

F
Fatty liver disease. *See* Nonalcoholic fatty liver disease
FODMAP, 99, 114–15

G
Gastroesophageal reflux disease (GERD)
case study of, 77–87
cause of, 75
incidence of, 75
nutrition therapy for, 369–70
Gastrointestinal disorders. *See also specific disorders*
lower gastrointestinal tract, 99–132
upper gastrointestinal tract, 75–98
Gastrointestinal surgery, 99
Gastroparesis
case study of, 89–98
definition of, 75
GERD. *See* Gastroesophageal reflux disease
GFR. *See* Glomerular filtration rate
Glasgow coma scale, 265
Gliadin, 99
Glomerular filtration rate (GFR), 206
Glomerulonephritis, 211–21
Gluten, 99, 372

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Growth charts, 8, 275, 363–64
Gunshot wounds, 295–306

H
Heart failure (HF)
  case study of, 63–73
  definition of, 37
  incidence of, 37
  pathophysiology of, 37
Hematology
  for abdominal gunshot wound, 301
  for acute kidney injury, 227
  for acute pancreatitis, 150
  for adult type 1 diabetes mellitus, 177
  for adult type 2 diabetes mellitus, 189
  for Alzheimer's disease, 250
  for bariatric surgery, 19–20
  for breast cancer, 325
  for celiac disease, 104
  for childhood obesity, 6
  for chronic kidney disease, 203, 216
  for chronic obstructive pulmonary disorder, 286
  for colorectal cancer, 350
  for Crohn's disease, 125
  description of, 361
  for gastroesophageal reflux disease, 82
  for gastroparesis, 94
  for heart failure, 68
  for hypertension/hyperlipidemia, 43–44
  for irritable bowel syndrome, 113
  for ischemic stroke, 238
  for malnutrition, 31
  for myocardial infarction, 57
  for nonalcoholic fatty liver disease, 137–38
  for pediatric cerebral palsy, 274
  for pediatric type 1 diabetes mellitus, 166
  for sepsis, 313
  for tongue cancer, 338
  for traumatic brain injury, 263
Hemodialysis, 197–210
Hepatobiliary disease, 131, 133–42
HF. *See* Heart failure
HHS. *See* Hyperglycemic hyperosmolar syndrome
History, admitting
  for abdominal gunshot wound, 296
  for acute pancreatitis, 144
  for adult type 2 diabetes mellitus, 184
  for bariatric surgery, 14
  for chronic kidney disease, 198, 212–13
  for chronic obstructive pulmonary disorder, 282
  for colorectal cancer, 346
  for Crohn's disease, 120
  for ischemic stroke, 234
  for pediatric cerebral palsy, 272
  for sepsis, 308
  for tongue cancer, 334
  for traumatic brain injury, 256
History, medical
  for abdominal gunshot wound, 296
  for acute kidney injury, 224
  for acute pancreatitis, 144
  for adult type 1 diabetes mellitus, 174
  for adult type 2 diabetes mellitus, 184
  for Alzheimer's disease, 246
  for bariatric surgery, 14
  for breast cancer, 322
  for celiac disease, 102
  for childhood obesity, 4
  for chronic kidney disease, 198, 212
  for chronic obstructive pulmonary disorder, 282
  for colorectal cancer, 346
  for Crohn's disease, 120
  for gastroesophageal reflux disease, 78
  for gastroparesis, 90
  for heart failure, 64
  for hypertension/hyperlipidemia, 40
  for irritable bowel syndrome, 110
  for ischemic stroke, 234
  for malnutrition, 28
  for myocardial infarction, 52
  for nonalcoholic fatty liver disease, 134
  for pediatric cerebral palsy, 272
  for pediatric type 1 diabetes mellitus, 160
  for sepsis, 308
  for tongue cancer, 334
  for traumatic brain injury, 256
History, nutrition
  for acute pancreatitis, 147
  for adult type 1 diabetes mellitus, 175
  for adult type 2 diabetes mellitus, 186
  for Alzheimer's disease, 248
  for breast cancer, 323
  for celiac disease, 103
  for childhood obesity, 5
  for chronic kidney disease, 200, 214
  for chronic obstructive pulmonary disorder, 284
  for colorectal cancer, 348
  for Crohn's disease, 122–23
  for gastroesophageal reflux disease, 79
  for gastroparesis, 92
  for heart failure, 66
  for hypertension/hyperlipidemia, 41
  for irritable bowel syndrome, 111
  for ischemic stroke, 236
  for malnutrition, 29
  for myocardial infarction, 55
  for nonalcoholic fatty liver disease, 135–36
  for pediatric cerebral palsy, 273

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

for pediatric type 1 diabetes mellitus, 162–63
for tongue cancer, 336
for traumatic brain injury, 259
Hyperglycemia, 293. *See also* Diabetes mellitus
Hyperglycemic hyperosmolar syndrome (HHS), 191
Hyperlipidemia, 39–49
Hypertension
case study of, 39–49
definition of, 37
essential, 37
kidney disease and, 195
prevalence of, 37
types of, 37

I
IBS. *See* Irritable bowel syndrome
Indirect calorimetry in critical care, 379–80
Inflammatory bowel disease
case studies of, 119–30
types of, 99
Insulin resistance, 293
Insulin therapy, for adult type 2 diabetes mellitus, 183–93
Intake/output
for abdominal gunshot wound, 299
for acute kidney injury, 226
for acute pancreatitis, 147
for adult type 2 diabetes mellitus, 187
for Alzheimer's disease, 248
for bariatric surgery, 17
for chronic kidney disease, 201, 217
for colorectal cancer, 350
for Crohn's disease, 123
for heart failure, 69
for malnutrition, 29
for pediatric type 1 diabetes mellitus, 164
for sepsis, 311
for tongue cancer, 339
for traumatic brain injury, 260–61
Internet resources
for abdominal gunshot wound, 306
for acute kidney injury, 230
for acute pancreatitis, 156
for adult type 1 diabetes mellitus, 181
for adult type 2 diabetes mellitus, 193
for bariatric surgery, 25
for breast cancer, 331
for celiac disease, 108
for childhood obesity, 12
for chronic kidney disease, 210, 221
for chronic obstructive pulmonary disorder, 291
for colorectal cancer, 354
for Crohn's disease, 130
for gastroesophageal reflux disease, 87
for gastroparesis, 98
for heart failure, 73
for hypertension/hyperlipidemia, 49
for irritable bowel syndrome, 117
for ischemic stroke, 244
for malnutrition, 36
for myocardial infarction, 62
for nonalcoholic fatty liver disease, 142
for pediatric cerebral palsy, 278
for pediatric type 1 diabetes mellitus, 172
for tongue cancer, 344
for traumatic brain injury, 269
Interprofessional team-based care, 373–74
Irritable bowel syndrome (IBS)
case study of, 109–17
prevalence of, 99
Ischemic stroke, 233–44

K
Kidney disease
acute, 195, 223–30
chronic, 197–210
Kidney transplant, 211–21

L
Laboratory results
for abdominal gunshot wound, 300–302
for acute kidney injury, 226–27
for acute pancreatitis, 148–51
for adult type 1 diabetes mellitus, 176–78
for adult type 2 diabetes mellitus, 188–90
for Alzheimer's disease, 249–50
for bariatric surgery, 18–20
for breast cancer, 324–26
for celiac disease, 104
for childhood obesity, 6
for chronic kidney disease, 202–4, 214–16
for chronic obstructive pulmonary disorder, 284–86
for colorectal cancer, 348–49
for Crohn's disease, 124–25
for gastroesophageal reflux disease, 81–83
for gastroparesis, 93–95
for heart failure, 66–68
for hypertension/hyperlipidemia, 42–44
for irritable bowel syndrome, 112–13
for ischemic stroke, 237–38
for malnutrition, 30–31
for myocardial infarction, 55–58
for nonalcoholic fatty liver disease, 136–38
for pediatric cerebral palsy, 274
for pediatric type 1 diabetes mellitus, 165–67
for sepsis, 312–14
for tongue cancer, 337–38
for traumatic brain injury, 262–64

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Laboratory tests, 361–62
LES. *See* Lower esophageal sphincter (LES) incompetence
Lispro, 191
Lower esophageal sphincter (LES) incompetence, 75
Lower gastrointestinal disorders. *See also specific disorders*
  case studies of, 101–32
  types of, 99
Low-FODMAP diet, 99, 115

M
Malnutrition
  chronic disease and, 27–36
  chronic obstructive pulmonary disease and, 279
  health consequences of, 1
  heart failure and, 63–73
  incidence of, 131
  nutrition-focused physical examination for, 365–66
  pulmonary disorders and, 279
Medical abbreviations, 355–58
Medical history
  for abdominal gunshot wound, 296
  for acute kidney injury, 224
  for acute pancreatitis, 144
  for adult type 1 diabetes mellitus, 174
  for adult type 2 diabetes mellitus, 184
  for Alzheimer's disease, 246
  for bariatric surgery, 14
  for breast cancer, 322
  for celiac disease, 102
  for childhood obesity, 4
  for chronic kidney disease, 198, 212
  for chronic obstructive pulmonary disorder, 282
  for colorectal cancer, 346
  for Crohn's disease, 120
  for gastroesophageal reflux disease, 78
  for gastroparesis, 90
  for heart failure, 64
  for hypertension/hyperlipidemia, 40
  for irritable bowel syndrome, 110
  for ischemic stroke, 234
  for malnutrition, 28
  for myocardial infarction, 52
  for nonalcoholic fatty liver disease, 134
  for pediatric cerebral palsy, 272
  for pediatric type 1 diabetes mellitus, 160
  for sepsis, 308
  for tongue cancer, 334
  for traumatic brain injury, 256
Medical nutrition therapy, 157
Medical progress note
  for abdominal gunshot wound, 297
  for acute kidney injury, 224
  for acute pancreatitis, 148
  for adult type 2 diabetes mellitus, 186–87
  for gastroesophageal reflux disease, 78–79
  for gastroparesis, 90–91
  for morbid obesity, 310–11
  for myocardial infarction, 52–53
  for pediatric type 1 diabetes mellitus, 163
  for sepsis, 310–11
  for young adult traumatic brain injury, 259
Medical treatment plan
  for abdominal gunshot wound, 297
  for acute kidney injury, 225
  for acute pancreatitis, 148
  for adult type 1 diabetes mellitus, 175
  for adult type 2 diabetes mellitus, 187
  for bariatric surgery, 16
  for celiac disease, 103
  for childhood obesity, 5
  for gastroesophageal reflux disease, 79
  for gastroparesis, 91
  for hypertension/hyperlipidemia, 41
  for malnutrition, 29
  for nonalcoholic fatty liver disease, 135
  for pediatric cerebral palsy, 274
  for pediatric type 1 diabetes mellitus, 163
  for tongue cancer, 335
  for traumatic brain injury, 259
Mediterranean diet, 37, 59
Metabolic panel
  for abdominal gunshot wound, 300–301
  for acute kidney injury, 226–27
  for adult type 1 diabetes mellitus, 176–77
  for adult type 2 diabetes mellitus, 188–89
  for bariatric surgery, 18–19
  for breast cancer, 324–25
  for celiac disease, 104
  for childhood obesity, 6
  for chronic kidney disease, 202–3, 214–16
  for chronic obstructive pulmonary disorder, 284–85
  for Crohn's disease, 124–25
  description of, 361–62
  for gastroesophageal reflux disease, 81–82
  for gastroparesis, 93–94
  for heart failure, 66–68
  for hypertension/hyperlipidemia, 42–44
  for irritable bowel syndrome, 112–13
  for ischemic stroke, 237–38
  for malnutrition, 30–31
  for myocardial infarction, 55–56
  for nonalcoholic fatty liver disease, 136–37
  for pediatric cerebral palsy, 274
  for pediatric type 1 diabetes mellitus, 165–66
  for sepsis, 312–13

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

for tongue cancer, 337–38
for traumatic brain injury, 262
Metabolic stress
description of, 293
gunshot wounds and, 295–306
obesity and, 293, 307–18
phases of, 304
sepsis and, 307–18
MI. *See* Myocardial infarction
Monitoring/evaluation
for abdominal gunshot wound, 305
for acute kidney injury, 229
for acute pancreatitis, 154
for adult type 1 diabetes mellitus, 180
for adult type 2 diabetes mellitus, 192
for Alzheimer's disease, 253
for bariatric surgery, 24
for breast cancer, 329
for celiac disease, 106–7
for childhood obesity, 10
for chronic kidney disease, 220
for chronic obstructive pulmonary disorder, 289–90
for Crohn's disease, 128–29
for gastroparesis, 97
for irritable bowel syndrome, 116
for ischemic stroke, 241–43
for malnutrition, 35
for myocardial infarction, 61
for nonalcoholic fatty liver disease, 141
for pediatric cerebral palsy, 277
for pediatric type 1 diabetes mellitus, 170–71
for sepsis, 317
for tongue cancer, 343
for traumatic brain injury, 267
Morbid obesity. *See* Obesity
Myocardial infarction (MI)
case study of, 51–62
definition of, 37
diagnosis of, 367–68
imaging of, 367–68

N

National Cancer Institute, 319
Neoplastic disease. *See also* Cancer
case studies of, 319–44
description of, 319
Neurological disorders, 231. *See also specific disorders*
Nonalcoholic fatty liver disease (NAFLD), 131, 133–42
Nuclear medicine, 91–92
Nursing assessment
for abdominal gunshot wound, 298–99
for acute kidney injury, 225
for acute pancreatitis, 145–46
for adult type 1 diabetes mellitus, 175
for adult type 2 diabetes mellitus, 185–86
for Alzheimer's disease, 247
for bariatric surgery, 15
for chronic kidney disease, 199, 213–14
for chronic obstructive pulmonary disorder, 283
for colorectal cancer, 347
for Crohn's disease, 121–22
for heart failure, 65
for ischemic stroke, 235
for malnutrition, 29
for myocardial infarction, 54
for pediatric type 1 diabetes mellitus, 161–62
for sepsis, 309–10
for tongue cancer, 335–36
for traumatic brain injury, 258
Nutrition assessment. *See also* Assessment
for abdominal gunshot wound, 303–4
for acute kidney injury, 228–29
for acute pancreatitis, 152–53
for adult type 1 diabetes mellitus, 180
for adult type 2 diabetes mellitus, 192
for Alzheimer's disease, 252
for bariatric surgery, 23
for breast cancer, 328
for celiac disease, 105–6
for childhood obesity, 7–9
for chronic kidney disease, 218–19
for chronic obstructive pulmonary disorder, 288
for colorectal cancer, 352
for Crohn's disease, 127
for gastroesophageal reflux disease, 85
for gastroparesis, 96–97
for heart failure, 66, 70–72
for hypertension/hyperlipidemia, 46–48
for irritable bowel syndrome, 115
for ischemic stroke, 240–41
for malnutrition, 33–34
for myocardial infarction, 55, 59–61
for nonalcoholic fatty liver disease, 140
for pediatric cerebral palsy, 276
for pediatric type 1 diabetes mellitus, 169–70
for sepsis, 316
for tongue cancer, 341–42
for traumatic brain injury, 265–66
Nutrition consult, 298
Nutrition diagnosis. *See also* Diagnosis
for abdominal gunshot wound, 304
for acute kidney injury, 229
for acute pancreatitis, 153
for adult type 1 diabetes mellitus, 180
for adult type 2 diabetes mellitus, 192

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Nutrition diagnosis (*continued*)
for Alzheimer's disease, 252–53
for bariatric surgery, 23
for breast cancer, 328
for celiac disease, 106
for childhood obesity, 9
for chronic kidney disease, 208, 219
for chronic obstructive pulmonary disorder, 288
for colorectal cancer, 352
for Crohn's disease, 127
for gastroesophageal reflux disease, 86
for gastroparesis, 97
for heart failure, 72
for hypertension/hyperlipidemia, 48
for irritable bowel syndrome, 115
for ischemic stroke, 241
for malnutrition, 35
for myocardial infarction, 61
for nonalcoholic fatty liver disease, 140
for pediatric cerebral palsy, 276
for pediatric type 1 diabetes mellitus, 170
for sepsis, 316
for tongue cancer, 342
for traumatic brain injury, 266
Nutrition history
for acute pancreatitis, 147
for adult type 1 diabetes mellitus, 175
for adult type 2 diabetes mellitus, 186
for Alzheimer's disease, 248
for breast cancer, 323
for celiac disease, 103
for childhood obesity, 5
for chronic kidney disease, 200, 214
for chronic obstructive pulmonary disorder, 284
for colorectal cancer, 348
for Crohn's disease, 122–23
for gastroesophageal reflux disease, 79
for gastroparesis, 92
for heart failure, 66
for hypertension/hyperlipidemia, 41
for irritable bowel syndrome, 111
for ischemic stroke, 236
for malnutrition, 29
for myocardial infarction, 55
for nonalcoholic fatty liver disease, 135–36
for pediatric cerebral palsy, 273
for pediatric type 1 diabetes mellitus, 162–63
for tongue cancer, 336
for traumatic brain injury, 259
Nutrition intervention
for abdominal gunshot wound, 304
for acute kidney injury, 229
for acute pancreatitis, 153
for adult type 1 diabetes mellitus, 180
for adult type 2 diabetes mellitus, 192
for Alzheimer's disease, 253
for bariatric surgery, 23
for breast cancer, 328–29
for celiac disease, 106
for childhood obesity, 9–10
for chronic kidney disease, 208–9, 219–20
for chronic obstructive pulmonary disorder, 289
for colorectal cancer, 352–53
for Crohn's disease, 128
for gastroesophageal reflux disease, 86
for gastroparesis, 97
for heart failure, 72
for hypertension/hyperlipidemia, 48
for irritable bowel syndrome, 115–16
for ischemic stroke, 241
for malnutrition, 35
for nonalcoholic fatty liver disease, 140–41
for pediatric cerebral palsy, 276–77
for pediatric type 1 diabetes mellitus, 170
for sepsis, 316–17
for tongue cancer, 342–43
for traumatic brain injury, 266
Nutrition monitoring/evaluation
for abdominal gunshot wound, 305
for acute kidney injury, 229
for acute pancreatitis, 153
for adult type 1 diabetes mellitus, 180
for adult type 2 diabetes mellitus, 192
for Alzheimer's disease, 253
for bariatric surgery, 24
for breast cancer, 329
for celiac disease, 106–7
for childhood obesity, 10
for chronic kidney disease, 220
for chronic obstructive pulmonary disorder, 289–90
for Crohn's disease, 128–29
for gastroparesis, 97
for irritable bowel syndrome, 116
for ischemic stroke, 241–43
for malnutrition, 35
for myocardial infarction, 61
for nonalcoholic fatty liver disease, 141
for pediatric cerebral palsy, 277
for pediatric type 1 diabetes mellitus, 170–71
for sepsis, 317
for tongue cancer, 343
for traumatic brain injury, 267
Nutrition therapy
for abdominal gunshot wound, 303
for acute kidney injury, 228
for acute pancreatitis, 152

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

for adult type 1 diabetes mellitus, 179
for adult type 2 diabetes mellitus, 192
for Alzheimer's disease, 251–52
for bariatric surgery, 22
for breast cancer, 327–28
for celiac disease, 105
for childhood obesity, 7
for chronic kidney disease, 205–7, 218
for chronic obstructive pulmonary disorder, 287–88
for colorectal cancer, 351–52
for Crohn's disease, 126–27
for gastroesophageal reflux disease, 85, 369–70
for gastroparesis, 96
for heart failure, 70
for hypertension/hyperlipidemia, 46
for irritable bowel syndrome, 114
for ischemic stroke, 239–40
for malnutrition, 32
for myocardial infarction, 59
for nonalcoholic fatty liver disease, 139
for pediatric cerebral palsy, 275–76
for pediatric type 1 diabetes mellitus, 169
for sepsis, 315
for tongue cancer, 340–41
for traumatic brain injury, 265
Nutritional care, cultural impact of, 369–70
Nutrition-focused physical examination, 34, 365–66

O

Obesity
in children, 1, 3–12
health consequences of, 1
metabolic stress and, 293, 307–18
nutrition support for, 293
Online resources
for abdominal gunshot wound, 306
for acute kidney injury, 230
for acute pancreatitis, 156
for adult type 1 diabetes mellitus, 181
for adult type 2 diabetes mellitus, 193
for bariatric surgery, 25
for breast cancer, 331
for celiac disease, 108
for childhood obesity, 12
for chronic kidney disease, 210, 221
for chronic obstructive pulmonary disorder, 291
for colorectal cancer, 354
for Crohn's disease, 130
for gastroesophageal reflux disease, 87
for gastroparesis, 98
for heart failure, 73
for hypertension/hyperlipidemia, 49
for irritable bowel syndrome, 117
for ischemic stroke, 244
for malnutrition, 36
for myocardial infarction, 62
for nonalcoholic fatty liver disease, 142
for pediatric cerebral palsy, 278
for pediatric type 1 diabetes mellitus, 172
for tongue cancer, 344
for traumatic brain injury, 269
Opioids, 293, 303
Organ rejection, 211–21
Output/intake
for abdominal gunshot wound, 299
for acute kidney injury, 226
for acute pancreatitis, 147
for adult type 2 diabetes mellitus, 187
for Alzheimer's disease, 248
for bariatric surgery, 17
for chronic kidney disease, 201, 217
for colorectal cancer, 350
for Crohn's disease, 123
for heart failure, 69
for malnutrition, 29
for pediatric type 1 diabetes mellitus, 164
for sepsis, 311
for tongue cancer, 339
for traumatic brain injury, 260–61
Oxygen, 279

P

Pancreatitis, acute, 143–56
Pathophysiology
for abdominal gunshot wound, 303
for acute pancreatitis, 152
for adult type 1 diabetes mellitus, 179
for adult type 2 diabetes mellitus, 191
for Alzheimer's disease, 251
for bariatric surgery, 21–22
for breast cancer, 327
for celiac disease, 105
for childhood obesity, 7
for chronic kidney disease, 205, 218
for chronic obstructive pulmonary disorder, 287
for colorectal cancer, 351
for Crohn's disease, 126
for gastroesophageal reflux disease, 84
for gastroparesis, 96
for heart failure, 70
for hypertension/hyperlipidemia, 45
for irritable bowel syndrome, 114
for ischemic stroke, 239
for malnutrition, 32
for myocardial infarction, 59

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Pathophysiology (*continued*)
for nonalcoholic fatty liver disease, 139
for pediatric cerebral palsy, 275
for pediatric type 1 diabetes mellitus, 168–69
for sepsis, 315
for tongue cancer, 340
for traumatic brain injury, 265
Pediatric case studies
cerebral palsy, 271–78
diabetes mellitus, 159–72
obesity, 1, 3–12
Peritoneal dialysis, 211–21
Physical examination
for abdominal gunshot wound, 296
for acute kidney injury, 224
for acute pancreatitis, 144–45, 148
for adult type 1 diabetes mellitus, 174–75
for adult type 2 diabetes mellitus, 184–85, 187
for Alzheimer's disease, 246–47
for bariatric surgery, 14–16
for breast cancer, 322–23
for celiac disease, 102–3
for childhood obesity, 5
for chronic kidney disease, 198–99, 212–13
for chronic obstructive pulmonary disorder, 282–83
for colorectal cancer, 346–47
for Crohn's disease, 120–21
for gastroesophageal reflux disease, 78–79
for gastroparesis, 90–91
for heart failure, 64–65
for hypertension/hyperlipidemia, 40–41
for irritable bowel syndrome, 110–11
for ischemic stroke, 234
for malnutrition, 28–29
for myocardial infarction, 52–53
for nonalcoholic fatty liver disease, 134–35
normal values for, 359–60
nutrition-focused, 34, 365–66
for pediatric cerebral palsy, 272–73
for pediatric type 1 diabetes mellitus, 160–61, 163
for sepsis, 308–11
for tongue cancer, 334–35
for traumatic brain injury, 256–57, 259
Pima Indians, 195–210
Progress notes. *See* Medical progress note
Progressive neurological disease, 245–54
Pulmonary disorders, 279. *See also specific disorders*

R
Radiation enteritis, 381–82
Renal disorders
acute type of, 195, 223–30
chronic type of, 195, 197–221
description of, 195
Renal Exchange list, 208
Renal replacement therapy (CRRT), 195, 198–210
Renal transplant, 211–21
Roux-en-Y surgery, 13–25, 307–18

S
Scintigraphy, 91–92
Sepsis, 307–18
"Skeleton in the Hospital Closet, The" (Butterworth), 1
Small intestinal bacterial overgrowth, 381–82
Stroke
case study of, 233–44
health consequences of, 231

T
Terminal illness, 342
Thiamine deficiency, 37
Tongue cancer, 333–44
Traumatic brain injury
case study of, 255–69
consequences of, 231
tTG antibodies, 105, 372
2015–2020 *Dietary Guidelines,* 37, 46
Type 1 diabetes mellitus
in adult patients, 157
in pediatric patients, 157, 159–72
Type 2 diabetes mellitus, 183–93, 198–210, 374–75

U
Ulcerative colitis, 99
Ultrasound, 135
Upper gastrointestinal disorders. *See also* specific disorders
case study of, 77–87
types of, 75
Urinalysis
for abdominal gunshot wound, 301–2
for acute pancreatitis, 150–51
for adult type 1 diabetes mellitus, 177–78
for adult type 2 diabetes mellitus, 189–90
for bariatric surgery, 20
for breast cancer, 325–26
for chronic kidney disease, 203–4
for gastroesophageal reflux disease, 82–83
for gastroparesis, 94–95
for heart failure, 69
for hypertension/hyperlipidemia, 44
for myocardial infarction, 57–58
for nonalcoholic fatty liver disease, 138
for pediatric type 1 diabetes mellitus, 166–67
for sepsis, 313–14
for traumatic brain injury, 263–64

V
Vitamin D, 376

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

W
Websites
for abdominal gunshot wound, 306
for acute kidney injury, 230
for acute pancreatitis, 156
for adult type 1 diabetes mellitus, 181
for adult type 2 diabetes mellitus, 193
for bariatric surgery, 25
for breast cancer, 331
for celiac disease, 108
for childhood obesity, 12
for chronic kidney disease, 210, 221
for chronic obstructive pulmonary disorder, 291
for colorectal cancer, 354
for Crohn's disease, 130
for gastroesophageal reflux disease, 87
for gastroparesis, 98
for heart failure, 73
for hypertension/hyperlipidemia, 49
for irritable bowel syndrome, 117
for ischemic stroke, 244
for malnutrition, 36
for myocardial infarction, 62
for nonalcoholic fatty liver disease, 142
for pediatric cerebral palsy, 278
for pediatric type 1 diabetes mellitus, 172
for tongue cancer, 344
for traumatic brain injury, 269
Weight loss, 27–36

Y
Young adult traumatic brain injury, 255–69

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s). Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. WCN 02-200-203

Copyright 2022 Cengage Learning. All Rights Reserved. May not be copied, scanned, or duplicated, in whole or in part. Due to electronic rights, some third party content may be suppressed from the eBook and/or eChapter(s).
Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. Cengage Learning reserves the right to remove additional content at any time if subsequent rights restrictions require it.